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160 hours of hard, relentless flying over ocean, desert and jungle – nearly 26,000 miles flown. That's the new piston-powered round the world speed record set by Max Conrad with official observer Dick Jennings in Piper Aztec N4544P. "Except for one precautionary exhaust stack replacement, we just put gas and oil in it," reports Max Conrad. "The Aztec and the Lycomings operated faultlessly. On a flight like this it's a great help to have confidence in your equipment."

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PIPER AIRCRAFT CORPORATION
Lock Haven, Pennsylvania

FLYING®

MAY, 1961

VOLUME 68, NUMBER 5

COVER: Just off the assembly line, the Rangemaster is an eye-catching business plane with more horsepower and higher airspeed than earlier Navions. FLYING's pilot flew the Rangemaster more than 1,000 cross-country miles during this first pilot report (see page 24). Photo by Bert Brandt.

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NEXT MONTH FLYING, along with its first-hand coverage of civil aviation, gives a special salute to Naval Aviation, which is celebrating its 50th year of operational readiness. Text and pictures will cover a half century of progress, include on-the-spot reporting of present-day operations, with an eye to the immediate years ahead.

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Ziff-Davis Publishing Company Editorial and Executive Offices
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WINGS and THINGS

JET-POWERED COMMANDER is expected to be announced this month by Aero Commander, Inc. The pure jet reportedly will be powered by two General Electric CJ610-2B turbojets rated at 2,400 lbs of thrust each. Maximum gross weight of the new airplane is said to be about 12,500 lbs. Seating will accommodate six passengers and a crew of two. First flight of the prototype is planned for 1962. For additional details of Model 1121 turn to the article on page 36.

NEW BELL HELICOPTER *also will be announced this month, for June delivery. The 47G-3B is a three-place utility rotorcraft, aimed at the commercial market, and powered by a Lycoming TVO-435 utilizing an AiResearch T-11 exhaust-driven supercharger permitting engine to maintain 260 hp through an altitude range of sea level to 15,000 ft. Payload will exceed 1,100 lbs. At max of 2,850 lbs the helicopter will hover in ground effect at 18,000 ft; out of ground effect at 15,600 ft.*

FOUR-ENGINE DOVE. Riley Aircraft, Ft. Lauderdale, Fla., is engineering a four-engine version of the twin deHavilland Dove, utilizing fuel-injected 260-hp Continental powerplants. Aircraft normally is powered by two 380-hp deHavilland Gypsy Queens. Conversion is expected to promote generally higher performance; particularly in speed and altitude. Company also offers the Riley Model 65, a redesigned version of the Cessna 310.

DORNIER DO-27, *single-engine STOL aircraft normally powered with a 270-hp Lycoming, has been fitted with a Turbomeca Astazou turboprop of about 440 shp; first turbine flights were made in March. The six-place high-wing airplane may be marketed here. Cost of piston-powered version approximates $28,000.*

ARMY AVIATION, searching for better mobility and ground support, has been investigating light ground attack fighters including the Italian Fiat G.91 (See FLYING, March and April). Among U. S. aircraft being evaluated are Northrop's N-156F Freedom Fighter and its T-38 Talon trainer; at this writing Army had put in over 40 hours on the latter, at Edwards AFB. For complete details on this world's fastest trainer, turn to the pilot report on page 30.

AMONG SCHEDULED LINES *competing for the tri-terminal operation between Dulles, Washington National and Friendship airports are Allegheny, Lake Central and Piedmont airlines. Before rendering feeder service rights decision, CAB will be briefed and advised by manufacturers of both fixed-wing and rotary-wing aircraft suitable for this operation. Boeing-Vertol 107 twin-rotor turbine is said to come close to meeting requirements.*

RUSSIAN NUCLEAR BOMBER feature of Korean underground report on "phantom warplane" that 1) can fly an average 2,500 mph with top speed of 3,500 mph; 2) can cruise, non-stop, for 90 days with first flight test running 21 days; 3) can fly at 85,000 ft.; 4) can avoid and break through radar detection systems and, in experiments, broke through the Soviet radar system 23 times out of 25 attempts in 10 major Russian cities.

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MAILBOX

THE FIRST IN 20 YEARS

. . . We are in the process of constructing the first new airport in the Chicago land area in the last 20 years. This airport will comprise a 3,000-foot lighted black top runway, adequate outside and inside area to handle 250 airplanes, ultra modern administration building housing operations, flight school, radio maintenance and sales; lounge, snack-bar, motel units and private offices for use of the airport patrons. Other features will include unicom, teletype, and direct line to Joliet omni for filing flight plans.

There will also be shuffleboard, putting green and swimming pool for the clientele. Piper aircraft sales and service will be handled here.

The entire field will be landscaped . . . Located three-eights of a mile west of Roselle, Ill. (or eight miles due west of O'Hare), the airport is known as Roselle Field and is expected to be in full operation by June 1, 1961.

I felt that this might be of interest . . . since this is something that is long overdue in the Chicago land area.

LEONARD E. BOESKE
Villa Park, Illinois.

WEATHER BUREAU APPROVES

We have read with much interest two articles by Jack LeBarron in recent issues of FLYING.

The article entitled "What You Should Know About Ice" in the December 1960 issue is an excellent discussion of the present day aircraft icing problem. This should be particularly helpful to general aviation pilots.

The article entitled "Get the Most From The Weather Bureau" in the February 1961 issue is also a very fine article. The steps outlined by Mr. LeBarron should provide excellent guidance to pilots in finding for themselves the weather reports and forecasts necessary for flight planning. Our meteorologists on duty will, of course, continue to assist the pilot with special weather service requirements.

N. A. LIEURANCE, Associate Chief
U.S. Weather Bureau—Aviation
Washington, D. C.

I would like to congratulate Jack Le Barron for his helpful and informative article. . . . The development of this systemized manner of checking weather information and examining elements in a step by step routine has proven invaluable to me as a student pilot, and many others I am sure.

A. B. NICHOLS
Springfield, Pa.

UNDERPRICED OR OVERPRICED?

The letter in a recent "Mailbox" by E. G. Ege, taking issue with low instruction rates at Louisville, Kentucky's Bowman Field ("America's Busiest Airport," by C. L. Hamilton, November FLYING), is timely. As he puts it, general aviation operations are underpriced. As a small operator, I know this to be true. Yet, if you talk to the lad working at a filling station trying to get money for flight time, you will hear that we are overpriced. What then is wrong with this particular picture?

First, the majority of airplane manufacturers are overpricing their product. Sales are aimed at the "business aircraft bracket" and these buyers never ask why the price is so far out of line because the cost is always written off in tax juggling . . .

Second, any cost savings achieved by efficiencies of mass production seem to be gobbled up in management; a "marketing" department and "sales" department which combine efforts to con potential customers into buying an overpriced product. . . . Engineering departments stumble over themselves. . . . An aircraft production worker or certificated A&P mechanic is in an exceedingly low pay bracket as compared to an auto mechanic or carpenter; yet his work demands an exceedingly high degree of integrity. Each production worker carries on his back two or three executive drones.

Third, government over-regulation in the "type certification" of airplanes. . . . I would say let the government certificate the producer, with revocation the control for lack of integrity in production. As hard as it is to get people to use airplanes, they are not going to rush headlong into an aerial contraption produced by some fly-by-night factory.

Most small operators look for the day when they can look a prospective buyer in the eye and quote the price.

G. A. MACGREGOR, Operator/Manager
Olney-Noble Airport
Olney, Illinois.

VIVE LE VOLUME

I'd like to put my two-cents worth in answer to Mr. Ege. . . .

First let me say that I am not a high-paid executive in the $25,000-a-year class. I am an engineer for an oil company and a little closer to the $10,000-a-year category. . . . Most of my friends are in about the same financial position and they have told me they would like to learn to fly if it just didn't cost so darn much.

Mr. Ege asked to get down to the economic facts of life . . . so let's do.

Let's say that an operator charges $5 an hour for the instructor, and puts up a sign "Dual instruction in the brand new, all-fabric Humpty-Dumpty *only* $15 per hour."

Our $10,000-a-year people read this and "Hm-m—too expensive as usual!" And the $25,000-a-year boys read it and four of 'em decide that now's the time to go out and stall a few. They go out on one day and fly a total of four hours and the operator collects a total of $60. Then let's say that he averages four hours per day per year. That's keeping the Humpty Dumpty in the air a total of 1,460 hours. At this rate let's assume the plane costs him $6 an hour to operate (a reasonable figure as far as Cessna's concerned with its 150). So for one day's operation, the plane's cost is $24. He pays the instructor $3.50 an hour, or a total of $14. The operator's net profit, $12 per day.

Now our intrepid operator decides to change tactics. "Let's go for volume," he says, "and put prices down where more people can fly." . . . He puts out a sign: "Dual Instruction, only $10 an hour." Now he

(Continued on page 6)

ATTENTION!

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For other courses, see pages 56, 75, 82

MAILBOX

(Continued from page 4)

pulls out more people like me, by far a much larger group salary-wise than the executive boys.

The Humpty Dumpty now flies eight hours a day and the operator collects a total of $80. The Humpty Dumpty is now flying about 2,920 hours per year . . . the plane costs about $5 per hour to operate . . . one day's operation costs $40 for the plane. He pays the instructor $3 an hour, or a total of $24. Net profit—$16 per day, or $4 more than under the old regime.

Now, Mr. Ege might say, "Ah-ha—but he cut the instructor's pay by 50 cents an hour." True. But what would you rather do, Mr. Ege, sit around four hours a day with limited volume and make $14 a day or work eight hours and make $24. I'll pick the $24 every time.

The conclusion: Vive le volume!

L. J. Davignon Jr.

Houston, Texas.

AERIAL TELEPHONE PATROLMEN

The first aerial patrol of telephone cables was done by Southern Airways Co. under a contract dated July 23, 1948, with the American Telephone and Telegraph Co. (Long Lines Department), Atlanta, Ga. This contract called for a once-a-week patrol of the buried cable from Jacksonville, Fla., to Evansville, Ind. We used a 65-hp Piper PA-11. The terrain ranged from the edge of the Okefenokee Swamp north of Jacksonville, to the rugged Cumberland Mountains between Chattanooga and Nashville, Tenn.

We are writing this note to you because of the "first" claim made in the fine article "Telephone Air Patrol" by Lois Philmus in the March, 1961 issue of Flying. We do not wish to detract from the work being done by Union Flights, Inc. They seem to be doing a superior job, and have our best wishes for success.

Jess Childress, Vice President
Southern Airways Co.
Atlanta, Ga.

CARBURETOR HEAT

I call attention to the article "Max Conrad Flies Godfrey Aztec," page 84 of March Flying. It is stated that Mr. Conrad uses carburetor heat to achieve an economical cruise, and that a carburetor air temperature of 90-100 degrees F will give the best results. Perhaps the statement should read 9-10 degrees Centigrade. But it is still a waste of power potential . . .

One of the most heavily stressed points in a course on reciprocating engine operation is that the higher the carburetor air temperature the lower the resistance to detonation. Higher CAT increases cylinder combustion chamber pressures and temperatures, and increases the rate of combustion in the cylinder. Detonation is an extremely high rate of combustion, or explosion, which causes excessively high combustion chamber pressures. These excess pressures result in rapid failure of piston or cylinder head. Because detonation is difficult to detect even in light plane engines, carburetor heat is to be avoided especially at high power settings, unless icing conditions prevail . . . As for an economical cruise with carburetor air preheated, in non-icing conditions, it is impossible . . . Carburetor heat is an excellent tool for the airman especially at closed throttle operation in glides, and in freezing rain, and wet snow . . . However, incautious use of this tool can cost loss of power, high fuel consumption, even cylinder and engine failures . . .

. . . I do hope this letter will prompt you to print a correction of that 90-100 degree F carburetor air temperature attributed to Mr. Conrad before there is a rash of light planes blowing jugs out through the cowling.

Marshall N. Higgins

Brentwood, New York.

• *Engine and sparkplug people queried on this say no detonation or significant loss of power should result with Conrad's carburetor heat method, and that benefits may result.*—Ed.

PRIVATE FLYING IN FRANCE

Ever since receiving my Private Pilot's license in May 1958 at Pearland, Tex., I have taken every opportunity available to fly. . . . Therefore, it was with some trepidation that I viewed my company's offer last June to send me and my family to Bordeaux, France for two years. It was natural to assume that my flying would probably be halted for that period. Nevertheless, we came. How glad I am that we did.

Private flying in France is a going concern. There isn't the traffic or individual ownership of planes such as we know in the States, but each fair-sized town has its local flying club. These clubs are friendly and filled with people who are very enthusiastic about flying. The Aero-Club de Bordeaux-Yvrac welcomed me wholeheartedly . . . the only American in the club. Their instructor, Jean Perechon, tutored me in the air and on the ground so ably that I had no trouble passing the exams for my French license, of which I am very proud. Not only that, but much of the instruction was given in the French Stampe open cockpit biplane. That was the realization of my second dream—flying an open cockpit biplane. One's first loop is nearly as thrilling as his first solo.

Our club has three airplanes; two Jodels and the Stampe. The Stampe is marvelous to fly because of its super-sensitivity. It is about time some American manufacturer produced a low-cost biplane for those of us who are interested in doing something more in an airplane than to merely travel pleasantly and quickly from A to B.

Ernest H. Hume

Merignac (Gironde), France.

MUCHAS GRACIAS

Just a note to tell you what a swell magazine you people have. I find all the stories and other features most enjoyable and am sure I will continue to do so as long as Flying is published.

Just for the record, Flying is enjoyed throughout the base here at Zaragoza, Spain. They can't keep them on the newsstands, hardly. . . .

A/2C L. E. Alvord

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BRIEFINGS...

Establishment of an intermediate airway system and the lowering of the floor of the continental control area from 24,000 to 14,500 feet became effective April 6. The intermediate system provides an express airway primarily for long and medium haul aircraft; also transition to and from the low (below 14,500 feet) and high (above 24,000 feet) altitude structure. With the lowering of the control area floor, all air traffic above 14,500 feet (over continental U. S. excluding Alaska), will fly in controlled airspace. Flight under both visual flight rules (VFR) and instrument flight rules (IFR) is permissible in this intermediate controlled area with weather conditions the determining factor.

Among the first to provide a separate runway for pilots flying light planes under 7,000 pounds, Akron-Canton (Ohio) airport has officially opened an E/W runway for this type plane. Designated 09-27, the runway is 3,200 feet long and 50 feet wide. It can be used when winds exceed 12 knots from either east or west.

This year United Air Lines celebrates its 35th anniversary. It traces its history back to April 6, 1926 when Leon Cuddeback flying a Swallow biplane took off from Pasco, Wash. for Elko, Nev., via Boise, Idaho, establishing the first commercial air

route in the nation. Cuddeback was a pilot for Varney Air Lines, one of the pioneer lines which became part of United. A former division chief of operations for United, Cuddeback is now supervising air safety investigator for the Civil Aeronautics Board at Oakland, California.

Winners of the Thompson Trophy Award are the B-58 crew of SAC's 43rd Bomb Wing of Carswell AFB, Texas for their world record of 1,284.73 mph over a 1,000-kilometer course. The crew: Maj. Harold E. Confer, pilot; Maj. Richard H. Weir, navigator-bombardier, and Capt. Howard S. Bialis, defensive systems operator. Company president Gen. B. W. Chidlaw (USAF-ret.) made the presentation at an Air Foundation lunch in Washington, D. C.

Chicago's Midway Airport was triple leader in flying activity—itinerant, air carrier and total operations—over all the nation's airports in 1960; and Tamiami Airport, Fla., near Miami, placed second to Midway in total operations. For the first time this FAA statistical report includes general aviation itinerant flying, as recorded with airport control towers. Phoenix, Ariz. led in this category with 135,431 takeoffs and landings (figures exclude purely local flights); followed in order by Denver, Long Beach, Santa Monica and Van Nuys, Calif.; Wichita, Detroit's City Airport, Houston, Fort Lauderdale, and then by Fort Worth's Meacham.

A contract recently signed between Aerocar International Corp., Fort Worth, developers of the Autocar flying automobile, and Ling-Temco Electronics, Inc., Dallas, has paved the way for the latter to produce the four-wheeled, two-place Aerocar, a

pusher-type vehicle powered with a 143-hp Lycoming engine. The contract is contingent upon Aerocar International's obtaining sufficient firm orders by July 1, 1961 to justify mass production.

Special FAA regulation now in effect makes mandatory the reporting of navigation and communications equipment malfunctions by pilots in command of aircraft flying IFR in controlled airspace. Reports are to be transmitted to Air Traffic Control for such inflight equipment malfunctions as loss of VOR, TACAN, ADF, or low frequency navigation receiver capability; or, complete or partial loss of ILS receiver; or, impairment of air/ground communications capability.

Aero Club of Washington laid claim to the title "hosts with the most" in the capital city's aviation circle, when it corralled Alan Boyd as its February luncheon speaker for his first address as Civil Aeronautics Board Chairman. In an address entitled "State of

the Board," the new chairman detailed some of the serious problems calling for immediate action. Presiding was Aero Club President (Right) Edward W. Virgin, Eastern Representative, No. American Aviation, Inc.

In South America a Lake LA-4 single-engine amphibian is making a 20,000-mile 10-week tour of seven South American countries in an organized effort to sell this New England-made product to our southern neighbors. Piloted by Calvin Tompson of Lake Aircraft, accompanied by Air Carrier Service Corporation's Francisco J. Labarata (Air Carrier is foreign distributor for Lake) the amphibian will give demonstrations in 73 cities throughout Argentina, Brazil, Chile, Columbia, Peru, Uruguay and Venezuela.

Civil agencies of the Federal Government are asking Congress for some $20 million in funds to purchase 52 new aircraft for Fiscal 1962. The agencies also will operate their current fleet of 431 aircraft at a cost of $40 million plus, in carrying out duties that range from aerial border patrols to "smokejumper" operations. The Coast Guard is biggest user, with 134 aircraft;

(Continued on page 96)

VIP's Air Taxi—Prior to assuming the duties of FAA Administrator, Najeeb Halaby, of Santa Monica, Calif., was given a farewell luncheon at Los Angeles' Ambassador Hotel by the Aviation/Space Writers Assn. and Los Angeles Chamber of Commerce. A helicopter sent by Helicabs, Inc., local air taxi firm, whirled the Halaby family from their suburban home to the front lawn of the hotel in jig time. Pictured on arrival is the administrator with daughter, Alexa, five. Mrs. Halaby stands between daughter Liza, nine, and their seven-year-old son, Chris.

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NEW PRODUCTS

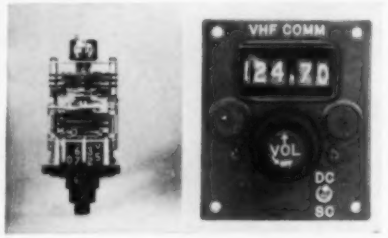
Dare, Inc., Troy, Ohio, is in production on its new DXT-10, (in photo) remotely controlled 360-channel VHF transmitter. The 10-pound, 10-watt unit features a transistor

power supply, modulator, side-tone and speech amplifier. The company also announces that its present production DTR-360B transmitter is available with transistor power supply.

Safety matches, waterproof, rodent and ant proof, are now available from Survival Equipment Co., division of Victor Tool, at Oley, Berks Co., Pa. Said to be a vast improvement over the older wooden paraffin-tip survival matches, the manufacturer guarantees that these matches will light "without fail after hours of submergence in water." List price per box, 75 cents; kit of three boxes, $2.

The Mark III, a new headset developed by Telex, Inc., St. Paul, Minn., features a higher impedance of 200,000 ohms, and frequency response 50 to 9,000 cps. Sensitivity of this new model Magna-Twin has been increased to 120 db (in 6 cc coupler, ASA Type 1) at 1,000 cps. at 1 mw. input. Reduction of ambient noise is said to result through a new design in foam rubber muffs, with secondary ear seals. The 12-ounce Mark III is adaptable to all types of boom microphones.

Designed to operate either the VHF communications radio or VHF navigation radio, or both, Gables Engineering, Inc., of Coral Gables, Fla. is marketing a remote control, internally lighted, radio frequency selector for general aviation aircraft. Reduced in size to less than three square inches, total



weight ranges from 12 to 16 ounces, depending on controls specified. Left picture shows maximum depth of five and one half inches required for installation behind panel. Variations of this panel are available for all standard VHF and HF units.

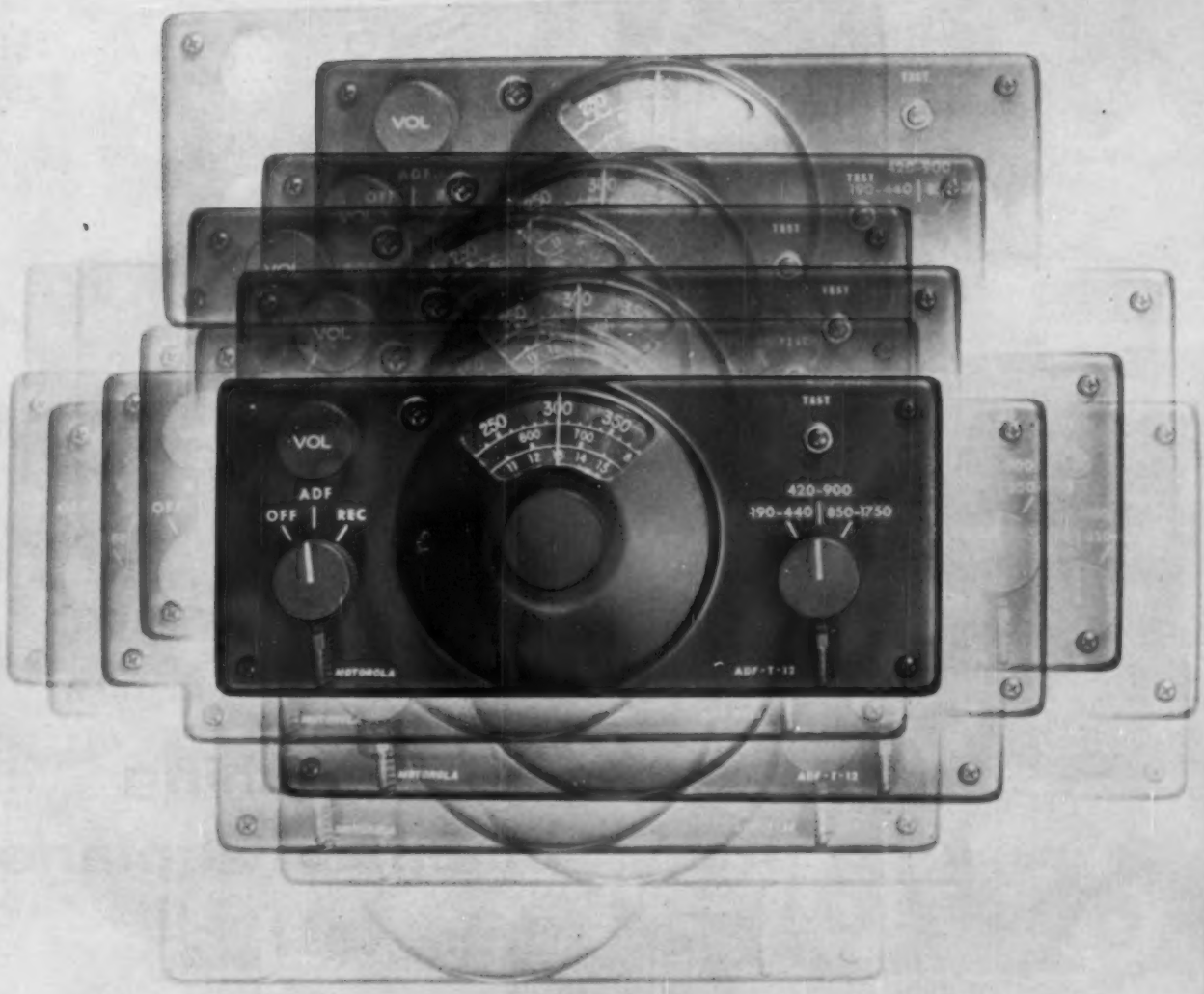
Roscoe Turner, aviation pioneer, has developed a 10.8-pound VHF transceiver. Designated the Turner 230c-1, it is a 360-channel unit with 50 kc spacing; frequency coverage 118.0 to 135.95 mc. The channelling mechanism is described as having only two moving parts driven by a magnetic electric motor. The Federal Division of ITT at Fort Wayne, Ind., is manufacturing the 230C-1 for newly formed Turner Aircraft Radio, Inc., located at Weir Cook Field, Indianapolis. First production models are off the line and the plant expects to produce about 500 radios within the next six months.

Survival vest designed by M/Sgt. Joseph O. Roberge, survival instructor USAF (ret), and manufactured exclusively by Utica-Duxbak Corp., Utica, N. Y., weighs 34 ounces; looks and wears like an ordinary hunting vest. Reversible, the vest is blaze orange on one side. All survival items are packed in vacuum sealed plastic bags, sewn between outer shell and lining of the vest. Two detailed instruction booklets on survival come with each vest. Sizes: small, medium, large and extra large. Price, $29.95.

First of General Electric's new line of miniaturized two-way radios is the G-E Pacer, a 15-watt unit using 15 tubes and two transistors, and selling for $419. Designed for operation in low band (25-50 mc) and high band (150-174 mc), the miniaturized Pacer, weighing 10 pounds, contains a transis-

torized power supply adaptable to 12-volt negative or positive ground electrical systems. Its battery drain is 4.2 amperes. The unit is complete with antenna equipment and installation cable. For further information contact GE's Communication Products Dept., Lynchburg, Va.

Under the trade name of PanCom, a new series of high frequency aircraft transceivers is being offered by PanTronics Corp., Fort Lauderdale, Fla. Known as the DX10-D and DX10-R the transceivers are both 10-channel, crystal-controlled with 50-watt transmitter output. The 10-D (above) is a direct panel-mounted unit with separate power supply; the 10-R a remote transceiver packaged with power supply in a short one-half ATR size. Both types are available in 12- and 24-volt versions and each weighs less than 15 pounds. Prices are said to be little higher than transceivers now available offering fewer channels.



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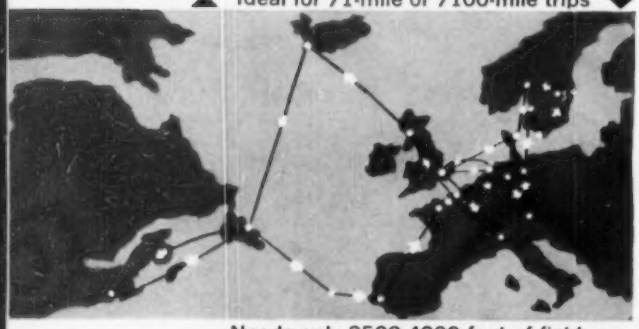

Needs only 3500-4000 feet of field ▼

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Independent of ground handling facilities ▼

The Gulfstream: the most do-everything business airplane there is!

The only aircraft in its class designed exclusively as a business airplane, the Grumman Gulfstream offers unique flight-and-ground flexibility. The following case history proves it.

Here's a factual example of Gulfstream flexibility. It's a story of how one Grumman Gulfstream was utilized as a sales tool by a well known chemical manufacturer on two important field trips. On both these trips the passengers were able to fly above weather or traffic, in comfort, in Gulfstream's pressurized cabin. They were able to land and take off from short fields close to their destinations, completely independent of ground handling facilities. And they were able to get to their destination faster because of Gulfstream's high door-to-door time and 350mph cruise speed.

TRIP NO. 1, 17½ HOURS. This field trip was arranged through Ohio and Indiana to bring together a group of distributors, providing each with an opportunity to observe one another's operations, and also to help integrate local with national sales promotion. On this trip, *during*

a single day, the Gulfstream made 8 stops to visit 6 distributors, and covered 1,356 miles. Cities visited included Evansville, Indianapolis, Dayton and Columbus (only 71 air miles apart) and Cincinnati. That night the plane returned to New York. Minimum number of passengers was 5—maximum, 12.

TRIP NO. 2, 17 DAYS. This same company visited its European distributors to set up new outlets for its products and to outline plans and programs for the coming year. Fourteen countries were visited. Meetings were held and plant tours were conducted in Paris, London, Zurich, Lisbon, Brussels, Cologne, Stockholm, Oslo, Copenhagen and many other cities. The manufacturer's comment on this trip—his second overseas in six months—was "on schedule—maintenance zero."

Flexibility like this—flexibility that makes the Gulfstream ideal for 71-mile or 7100-mile trips—is one reason why over 60 Gulfstreams are now in operation. Other reasons are Gulfstream's proven safety, reliability, comfort and beauty. In short, it's a sound business investment.

Corporate executives and pilots may arrange for demonstration flights through the following distributors: *In the United States:* Atlantic Aviation, Wilmington, Del. Pacific Airmotive, Burbank, Cal. Southwest Airmotive, Dallas, Tex. *In Canada:* Timmins Aviation, Montreal. *In Europe:* Atlantic Aviation Export Corporation, London, England.

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For reflex photography, Leica's dual-system provides through-the-lens groundglass focusing and viewing that's clearer, sharper, more accurate than any other reflex system.

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WHO and WHERE

John R. Wiley, aviation director, Port of New York Authority, is new president of The Wings Club, New York City. E. O. Cocke, Daniel J. Fraad Jr. and Frederick F. Robinson were elected vice presidents.

Shizuma Matsuo has been elected president of Japan Air Lines in Tokyo. Elected vice president is Kambu Ishikawa.

Herman J. Abs has succeeded retiring Dr. Kurt Weigelt as chairman of the board of Lufthansa German Airlines.

C. Rhoades MacBride, executive vice-president General Dynamics, has been named acting president of the company's Convair Division on resignation of J. V. Naish as president of Convair and vice president of the parent company.

James P. Conrad has joined King Radio Corp., Olathe, Kan. as Eastern Regional sales manager with offices at 23760 Wonneta Parkway, West Lake, Ohio.

Thomas F. McGarry, for the past four years a member of the aviation department of the Port of New York Authority, has become public relations director of the Air Transport Association, Washington, D. C.

Burt R. Gordon has taken the position of sales manager for Butler Airplane Sales, Eastern Division. Gordon's headquarters are in the firm's New York City offices at 655 Madison Avenue.

James E. Dow, career government aviation official, is advanced to chief of the Air Traffic Control and Navigations branch of Systems Engineering Division of FAA's Bureau of Research and Development. Dow began his air traffic control career in 1943 as an ATC trainee.

Roy E. Wendell has succeeded E. Russell Trotman as public relations director of Hamilton Standard division of United Aircraft Corp. Trotman has been transferred to the parent company.

Stewart E. Poole has been elected Board Chairman of Atlantic Aviation Corp., and Walter W. Richards corporate president.

Capt. Virgil Turnbull, with Braniff International Airways for the past 25 years, has retired at age 60. A 30,000-hour pilot, Turnbull began his flying career as a barnstormer in Oklahoma.

Beverly E. Howard, president of Hawthorne School of Aeronautics, Moultrie, Ga., is chairman of a technical committee recently established by the National Aeronautical Services Assn. to assist Army aviation in the study of specific aircraft maintenance problems.

Allan B. Heinsohn is elected vice president and Albert W. Shay, chief pilot, by Linden Flight Service, Inc., Beechcraft dealers at Linden Airport, N. J.

James H. Douglas, former Secretary of the Air Force, and Elwood R. Quesada, former FAA administrator, have joined the board of American Airlines, Inc.

Flies like a big airplane ■ has the speed of a big airplane ■ is roomy like a big airplane ■ has the range of a big airplane ■ totes useful load like a big airplane . . .

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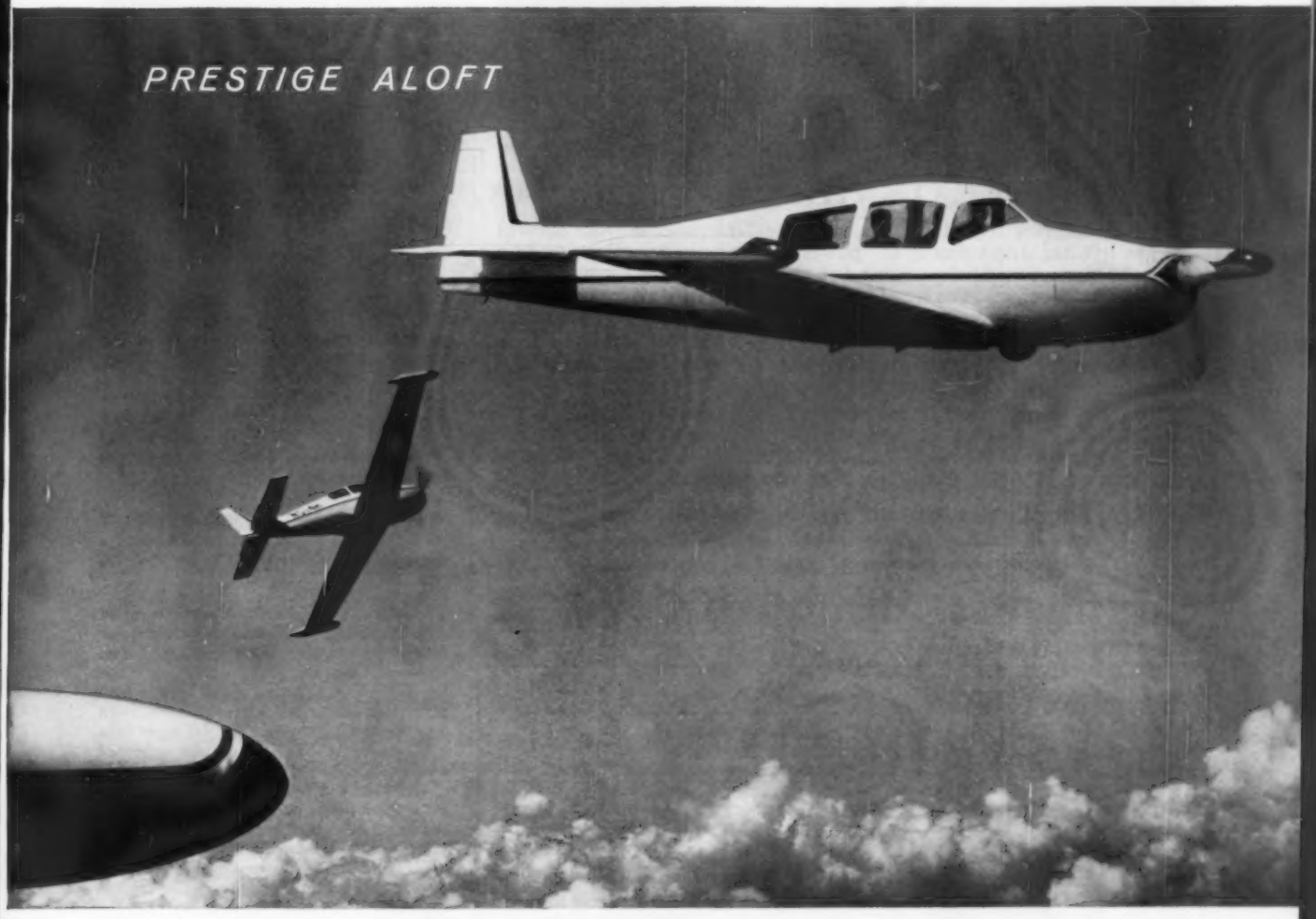

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■ Southwest Airmotive makes certain that your impeller will operate efficiently through the life of its overhaul by balancing it scientifically on a Model 31S Gisholt Dynetric Balancer, as shown above. We feel this is assurance that you deserve!

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HAVE YOU READ?

By JAMES F. SUNDERMAN

THE WILD BLUE: THE STORY OF AMERICAN AIRPOWER, edited by John F. Loosbrock and Richard M. Skinner (G. P. Putnam's Sons, 210 Madison Avenue, New York 16, N. Y., $5.95).

On September 21, 1918, the U.S. Air Service began publication of a Weekly News Letter, a mimeographed poop-sheet containing articles, news items, service social events, operations reports, and odds-and-ends of unusual flying import to members of the small air arm of the U.S. Army. From then until WW II, this News Letter changed names and publication periods and survived cutbacks. It grew in size and coverage. In July 1941 it became Air Force—a monthly magazine and continued through the war in slick format as the official journal of the AAF. After the war it was taken over by the Air Force Assn. where it is published today, a magazine of national influence and distribution.

The Wild Blue is an anthology which collects the best materials from this 42-year period of Air Force Magazine—embracing the entire development of American airpower. The selections provide an intriguing reading experience, from early military combat in WW I to the launch of our giant missiles in 1960. It is "the raw stuff of which history is made," an on-the-spot report through the experiences and the words of the men who have made Air Force history.

NINETY SECONDS TO SPACE: THE STORY OF THE X-15, by Jules Bergman (Doubleday, 575 Madison Ave., New York 22, N. Y., $4.50).

The Air Force-North American rocket ship X-15 has been about the most popular subject book writers have stumbled across in the post-war era. Bergman's story is the fourth book exploitation of this craft, which holds U.S. hopes of pushing manned flight into the space frontiers. It is far more than a biography of this strange new breed of research aircraft. He traces the evolution of the ships which led up to the X-15, their accomplishments and the men who have pioneered in high altitude, high speed flight. He projects ahead to the Super X-15 and the DynaSoar follow-ons which will indeed take men into far space. The book is copiously illustrated, well-written, and the best covered on the subject to date.

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New fuel injection power gives the Beechcraft B95A Travel Air exciting new performance, including 180 pounds more useful load. It flies at speeds up to 210 mph. Range, with reserve, is over 1,150 miles.

Big main baggage compartment and extra baggage area in nose section give you nearly 50 cu. ft. of luggage space.

Plenty of room for 5 people to travel in relaxed comfort in the Travel Air's big super-soundproofed cabin. Big, soft anatomy-contoured seats have fully reclining backs. New larger rear windows provide greater than ever visibility.

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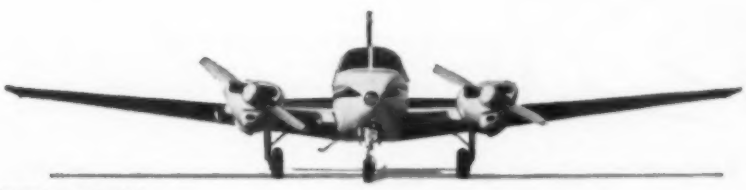
Now there are more reasons than ever for you to see and fly the Beechcraft Travel Air. Here is just a partial listing of what's new in the B95A Travel Air for 1961:

1. **NEW fuel injection system** on the Travel Air's two 180 hp Lycoming engines gives you easier starting at all temperatures, smoother running, more precise fuel metering and complete freedom from carburetor icing problems.
2. **NEW increased payload.** New 1,645 pound allowance for fuel, equipment, passengers and baggage lets the new Travel Air carry 180 pounds more useful load.
3. **NEW larger baggage compartment** in the nose. Big 3-suiter can be easily carried.
4. **NEW larger rear windows** provide nearly "around the clock" visibility.
5. **NEW larger air cushion flaps.** Solid stable feel in approach and landing.
6. **NEW accessory shelf** at rear of cabin for hats, purses, cameras or other personal items.

On top of all this, the Travel Air is still the roomiest, easiest-to-fly, easiest-on-gas twin that can come anywhere near its performance. Beechcraft distributors and dealers invite you to see and fly the new Travel Air yourself. Why not make a date now?



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A 'natural' on land . . . 'amazing' on water! Start with a big, fat fact. One-fifth of the area of the 50 States is water. Anywhere it's a foot-and-a-half deep, your Lake Amphibian is at home on it. With a *whish!* you're in for a true boat landing. *Vroom!* — you're airborne off water in 1125 feet or less (with full load).

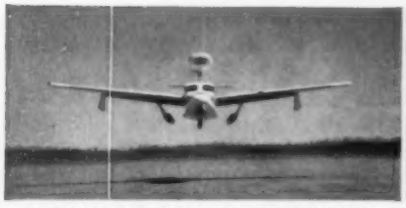
Two words are generally used to describe Lake's water performance. One is "amazing!" The other is "phenomenal!"

Lake puts the "other fifth" of America on your flight plan . . . not for kicks but for a purpose. This big amphibian with the built-in muscles brings you nearer to where you want to go, in business or your profession, than any other plane you know. On land, Lake's extra-wide landing gear is equally at home on airport strip or forest clearing.

Wherever a boat can float or a wheel can turn, Lake is at your service. In flight, a comfortable "multi-engine" feel goes hand-in-hand with a light-hearted buoyancy you'd never expect short of a glider.

If you are the pilot, you're bound to get a warm feeling from the prestige that rubs off on you from this practical plane. It's a workhorse but it sets you up like a Rolls.

Right now, write or phone for complete Lake specifications and the name of your nearest Lake Dealer. Make all America your own!



Quick start to a great trip! Lake, on land, is airborne in 650 feet or less.

An 81-MPH differential between cruising and stalling speeds lets you fit travel to conditions.

Let down the wheels and run it up on beach or ramp at your destination.

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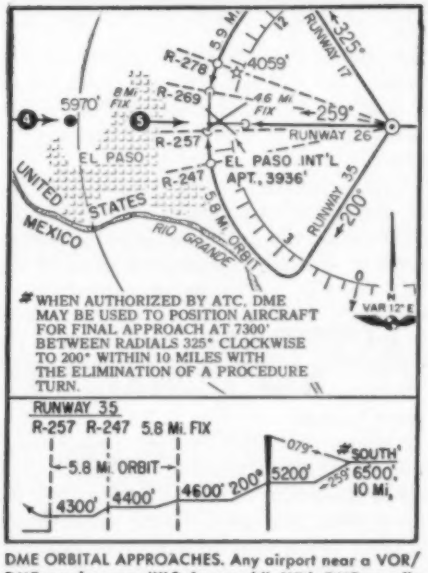
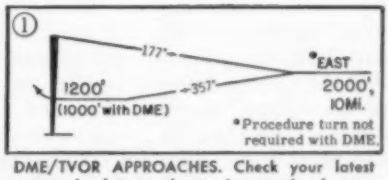
"42 MILES FROM THE OMNI!" Anytime, anywhere, on or off the airways, you can know your precise distance from a Vortac station with the Narco UDI-2 distance measuring equipment. With DME service being implemented over the entire Federal Airways System, Narco's new, exclusive, lightweight DME is the most useful new Navaid offered in a decade. Just read off the distance on the dial of your Narco DME, any distance up to 100 miles! Useful so many ways! You can quickly determine ground speed. Simplifies holding at an intersection. Expedites approaches by eliminating "high-cone" and other time-consuming procedures, permits new, more flexible instrument approach procedures to different runways or secondary airports, as these examples show.



DME ORBITAL APPROACHES. Any airport near a VOR/DME can have an "ILS Approach". With DME you fly a circle whose radius is the distance from the VOR to the runway. "Outer" and "middle" markers are determined by radials from Omni as this new DME approach to El Paso indicates.

(Charts reproduced courtesy Jeppesen and Co.)



DME/TVOR APPROACHES. Check your latest approach plates and note increased reference to DME and lower minimums with DME, such as TVOR approach to Rochester, N.Y., shown above.

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E Pluribus Unum

GILL ROBB WILSON
Publisher

EXECUTIONS WERE THEN public and this was the community's first hanging. The atmosphere was supercharged with emotion.

Suddenly, a young farmer strode up the scaffold steps, laid his hand on the shoulder of the condemned, and held it there as the trap was sprung. No one dared protest. They knew the iron in him.

In the wake of the dull thud, he turned to the crowd and said, "I did not come to see this man die but to share his shame. If as his neighbor I had rightly been my brother's keeper, he might not have been a murderer."

Many years later, the farmer was killed by an enormous pet bull. Standing as a boy beside Grandfather's casket, no affectionate memories haunted my mind. All too well I knew the granite discipline of the old Covenanter stockman. I had no tears for him.

Yet today when I see my father, himself nearing a century of life, leaning on Grandfather's cane, I think not of old men grown grey in honor, but of a young man standing defiant on a gallows charging himself with responsibility for its victim.

What impelled him? Had he reasoned it out that the democracy of the young nation was founded on the moral responsibility of the citizen? Had he philosophized that freedom was a product of the Golden Rule?

Perhaps. But might it not have been more simply that he and his generation had a unique advantage in motivation. Circumstance had conspired to focus sense of responsibility on a great dream—the Nation. Love of it had been forged to a passion in the breastworks of the Wilderness, at Shiloah, at Gettysburg. Abraham Lincoln had made the great dream articulate. The compassion of his yearning for the undivided land was a torch in their breasts. The songs of the Grand Army were no bawdy lyrics . . . "Mine eyes have seen the glory."

They welcomed the immigrant host from the sick old world. A dream is great only if it can be shared. They pushed beyond accustomed trails, weaving the nation's geography from coast to coast, from the Arctic to the Gulf. A great dream must not be circumscribed.

I do not judge that the youth of yesteryear had greater capacity for national responsibility than have the youth of today. Ours are rather caught in the millstones because the dream has grown dim, because the perspective has faded. Since men cannot live without dreams, the vacuum of the great one has been filled with incomparably lesser ones.

Potentially dedicated citizens trample the public weal in labor and business because they have been diverted from their real heritage. Intellectually adventurous students toy with the copperhead of socialism because they are unchallenged to vindicate their foundations. Black and white snarl over segregation while both are threatened by integration back into slavery. Jew and gentile, protestant and catholic, emphasize divisive dogma when the real issue is Godfearing society versus atheistic communism; and all cry "peace, peace," when there is no peace.

During the late political campaign, I heard much of "the religious issue," but did not hear one voice raised in thankfulness that, regardless of who won, the nation would have a man of God to lead it. Was that not the heart of the matter!

It can be that the saboteurs of the great dream, the cynical authors, the petty messiahs of minorities, the social soldiers of fortune, the crossword experts of education, the hermits of science, the partisans of every ilk, have levered us beyond the point of no return in patriotic responsibility. Perhaps the dream is as dead as Grandfather, as Lincoln, as the fine hour in which the Republic was forged upon the anvil of the citizen's responsibility. Perhaps we have joined the caravan of all who have gone before.

Yet my whole being resists this thought. I must recall that so long as one young man stood up to face Goliath, or one came out of a woodlot to restep the masts in the foundering ship of state, the cause of the great dream was not dead. I must look up to where in sheer devotion to patriotic responsibility a young man rides the X-15. I must ponder the waiting of the young astronauts as testimony that the dream is still bright somewhere. I must feel heartened to hear a young man say, "not what your country can do for you but what you can do for your country."

THE NEW 707 ASTROJET* JET AGE: STAGE II

Now offered in regular transcontinental passenger service, American Airlines' new 707 Astrojet brings you a new standard of jet performance by the airline that's *first choice of experienced travelers.*

Powered by revolutionary new Jet-Fan engines, the 707 Astrojet greatly outperforms all other airliners. It takes off more quickly, uses far less runway than the best of standard jets. Aboard it, you experience a wonderful feeling of confidence as the Astrojet climbs swiftly to cruise easily, smoothly, within the transonic range—faster than any other jetliner in the world.

In keeping with its 25-year tradition of leadership, American is proud to be first in bringing you this new dimension in jets—this historic new era in air travel.

AMERICAN AIRLINES
America's Leading Airline

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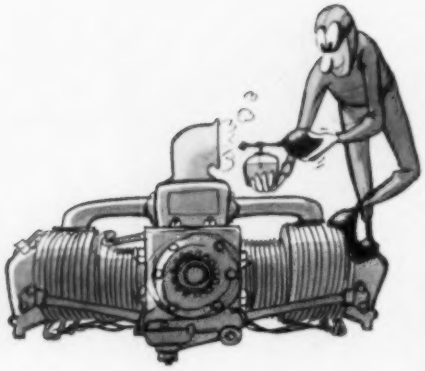
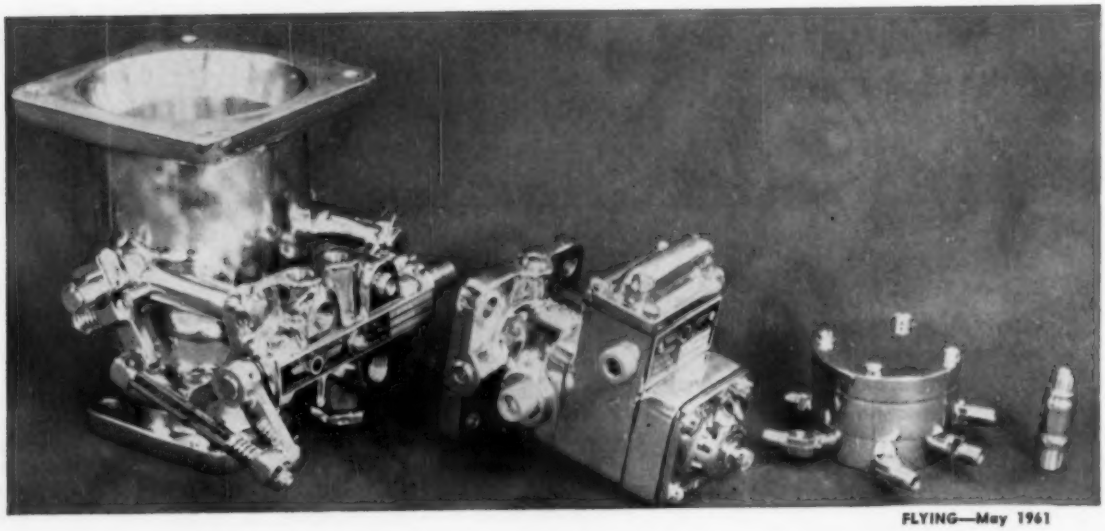


FUEL INJECTION

BOOST TO ENGINE POWER

Lacking most of the faults of carburetors, this system is rapidly gaining in application to smaller aircraft engines

By ALEX DAWYDOFF



TODAY, some 3,000 aircraft engines, ranging from 180 to 450 hp, have been equipped with fuel injection, which until four and a half years ago was the domain of large powerplants. Over the years, experience gained from operating these powerplants pointed, obviously, to the fact that their advantages should be applied to the smaller engines that are predominant in the field of business and personal flying.

What are these advantages that may some day push out the carburetor as a means of supplying power to an engine?

In order to produce power and operate efficiently the internal combustion engine requires a closely supervised diet consisting of a mixture of fuel and air. The most common device that is charged with this task, in the ignition type powerplant, is the carburetor. Its function is to measure the required liquid fuel, mix it with the right proportion of air for proper burning, and atomize the mixture before it is delivered to the combustion chambers of the cylinders.

The delivery is accomplished through the intake manifold, a series of large diameter pipes, one for each cylinder. The charge is drawn in by suction of the downward traveling piston during the intake stroke, at which time the intake valve opens to admit the air/fuel charge to the combustion chamber.

Carburetors have been in use practically since the invention of the four-cycle engine and, through constant improvement became reliable as well as quite efficient. However, they suffer from several disadvantages, the most important of which is the uneven fuel distribution with the result that some cylinders get a richer mixture than others. Acceleration forces, due to abrupt maneuvering or severe turbulence, also affect some types of carburetors, causing interruption of fuel flow. Last, but not least, icing is the carburetor's biggest foe, present even in warm weather, due to a radical drop in temperature, ranging between 30 to 70 degrees F, in the low pressure area of the carburetor venturi. This problem has been ameliorated in the pressure-injection carburetors but not completely licked.

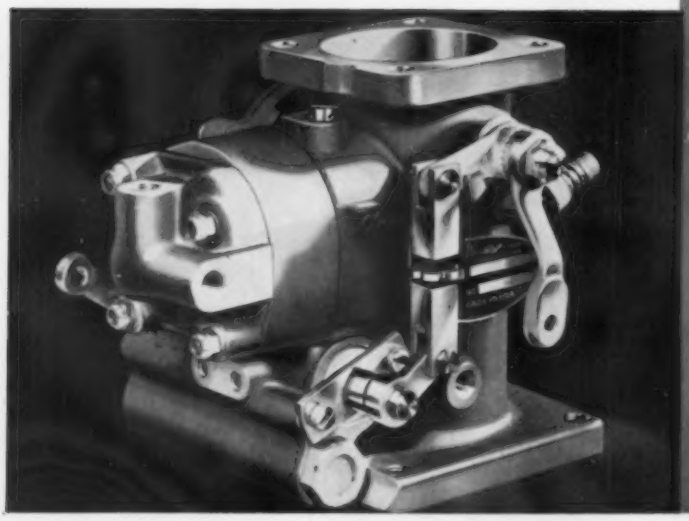
For a number of years, a different method of fuel induction—called fuel injection—has been under serious consideration by powerplant engineers. This system injects a combustible charge directly into the intake port of each cylinder, under forced draft, providing properly proportioned and distributed mixture. The results?

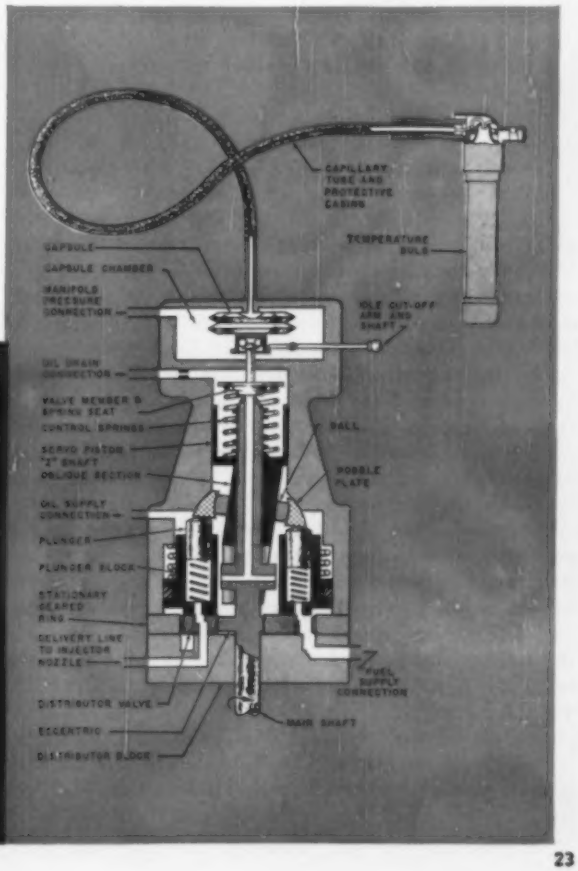
- Improved engine operation and performance, smoother idling, better throttle response.
- No effect from high acceleration forces, greater power output, improved fuel economy.
- Better and more uniform cylinder cooling and freedom from vaporization icing. Starting in cold weather is easier and engine warm-up faster.
- Power increase may be 10 per cent or higher over the same engine equipped with a carburetor and fuel economy improved by as much as 20 per cent.

Fuel injection is not new. Diesel engines have been using it for more than 50 years, and in the aircraft engine field it was available (*Continued on page* 82)

Below: Main body of the Bendix RS fuel injection incorporating the airflow sensing system, servo regulator and the fuel control unit. Not shown in photo are the fuel distributor and nozzles. *Right:* Cutaway of injector pump used in Simmonds intermittent flow system which delivers a timed and metered fuel mixture to the nozzles. Capsule, at top right, senses pressure and temperature and adjusts plungers.

Opposite page: Continental Motors fuel injection system showing, from right to left, fuel control unit utilizing throttle and mixture control; vane type fuel pump, metering valve and injection nozzle.





PILOT REPORT

The name is the same, but there has been a complete transformation. This first flight evaluation shows new highs in performance

By GERALD J. SCHLAEGER

NAVION

THE NAVION is back. Completely redesigned, the long-range five-place airplane—with its fuel-injected Continental IO-470H of 260 hp—is marked by a high degree of stability, speed, economy of operation and good general handling characteristics; capabilities noted by FLYING during the first evaluation of the 1961 Rangemaster.

Gone is the sliding canopy; it is replaced by a left-side door. New streamlining is responsible for an average six-mph increase in cruising speeds. At 7,000 feet, for instance, the airplane trued out at 182 mph at only 71 per cent power.

Basic price of the Rangemaster is $22,500 with standard equipment but less electronic gear. A package is under consideration where a price of $25,000 will include standard equipment plus ADF, VOR and VHF communications. Standard equipment includes a full panel and tip tanks.

Also increased as the result of the new look is interior space; it is now a five-place airplane. Seating configuration is 2, 2, 1; a six-place version is to be offered at a later date. Baggage space and weight would of necessity be limited on the six-place model. Visibility, however, would be excellent for all passengers, for even the rear seat occupants will be well within the rear window area.

A toilet is available as optional equipment located under one of the rear seats at extra cost. This would be desirable where the plane is used for family transportation and full advantage of the range of the Rangemaster is taken. It will save many unscheduled stops.

Interior decor is tastefully done in plastic, leather and high-quality wool. Seating arrangements are flexible and sufficient space is available for a six-foot divan, if desired. Forced air ventilation is provided with heat from the right exhaust manifold, mixed with unheated air to the desired temperature before reaching the outlets under the seats. The ventilation control is located on the lower center of the instrument panel.

Standard equipment on the Rangemaster includes: dual controls, vernier throttle, propeller, and fuel pressure controls, an electric fuel booster system, integral oil cooler, McCauley constant speed propeller and Woodward governor, heavy duty starter and engine mounts, and vibration insulators. Defrosters are standard and adequate. Super-soundproofing around the cabin is available.

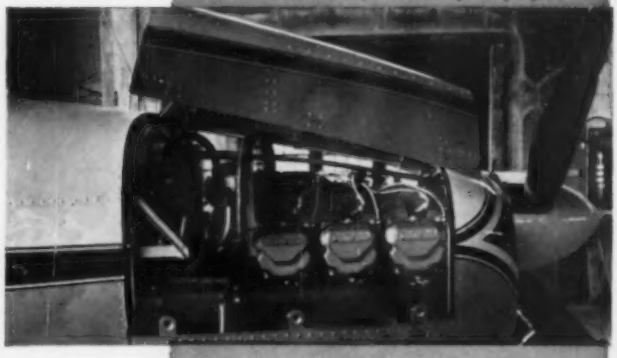
The instrument panel is well laid out; black crackle finish is used and the flight instruments are directly in front of the pilot. Radios are centered on the panel, and the engine instruments are on the right. Landing and cockpit lights and starter switches, as well as fuel gages and ammeter are located on the overhead panel.

Entrance to the cabin is through the door located mid-way between the pilot and passenger's seat on the left side. Pilot's seat travel is sufficient to permit entry behind or ahead of it. Passengers may embark or disembark in any sequence. A step built into the left flap near the fuselage facilitates reaching the wing-walk from the rear. It is fairly high, and a lady with a tight skirt might have problems.

A composite flight evaluation was conducted by FLYING at Scholes Field, Galveston, Tex., where the airplane is produced by Navion Aircraft Co., division of Tusco Corp. Two aircraft were used and a total of nearly 10 hours flown, including nearly 1,000 cross-country miles.

The sliding canopy has been replaced by a door, and the aircraft now seats five.

Below: Powerplant is a 260-hp fuel injection Continental with constant speed prop.



RANGEMASTER

Tip tanks are standard equipment on the new model. They help boost the range to 1,475 miles at normal cruise at 7,500 ft. with 30-minute reserve.

Navion's 1961 Rangemaster N510 H was the second prototype, with a totally new fuselage. It was just down from its maiden flight of 30 minutes. It was flown to determine specific performance and flight characteristics directly attributable to the new configuration. For comparison we flew an F model Navion identical to the new Rangemaster except that it retains the sliding-canopy-type fuselage. The aircraft has the 260-hp Continental Engine and tip tanks.

The new fuselage brings out the inherent beauty of the basic design. There are no breaks or sharp bends in its sleek lines, only a graceful sweep from nose to tail. Four color combinations are offered.

The Rangemaster deserves its name. Forty gallons of fuel is carried in two interconnected, single-point refueling wing tanks. Two 34-gallon tip tanks bring the overall total to 108 gallons. With the 260-hp IO-470-H fuel-injection engine, nine hours' endurance is available at 60 per cent power at a true airspeed of over 170 mph. At 46 per cent power, endurance goes to 12 hours; with 20 inches mp and 2,100 rpm at 7,000 feet, we trued out at 148 mph.

For those who have flown the earlier Navions, a report of extreme stability and solidness would be expected. For those who haven't, we can report this is one of the most stable single-engined airplanes manufactured in the United States today. One-degree heading changes can be accurately made and precise control of the vertical speed is not difficult. Tip tanks tend to increase the stability when they contain fuel, but feeding is selective and one wing becomes heavy after half an hour or so on the opposite tank. This presents no hardship, however, for return fuel is fed back into the main tank, which after an hour or so is filled and may be used for another three hours without changing the airplane's balance.

On one flight from Galveston we began using tip tank fuel when the main tank showed 10 gallons. At the end of an hour and a half the main tank was again full and we continued on to Fort Worth using main tank fuel. Leo Childs, Navion engineering vice president and general manager, says that his technique is to use all of the main tank fuel empty before going to the tips.

If the tips are run dry in the air and then refueled on the ground, a few anxious moments will be spent on the next flight when you switch them (*Continued on page 54*)

USED AIRCRAFT

TO BUY OR NOT TO BUY

FREEDOM. What is its price? What does a pilot have to pay to fly his own airplane, to have the friend of steel and glass and fabric that is the key to freedom?

There is more than one price to be paid. There is the price of money; there is the price of effort and time spent; the price of questions asked and answered. You must be able to say, "I can afford to give just this amount for my friend, and more would be too great a hardship on us both." You must know clearly what are your own needs and desires before you can see that airplane and know that it is really the right one. You must be willing to look for your friend in many places, sometimes for months, before you find him.

Most pilots who want to fly their own airplane, and some businessmen who need the freedom that an airplane gives them, do not have inexhaustible reserves of money to finance their airplane and its needs. Their sights are set on an airplane that is seasoned, that has its own log of experience in the air, that has been labelled, in a lamentable carryover from the dustbound world of automobile sales, a "used airplane."

Economically speaking, if you would fly an airplane more than four hours a week, 16 hours a month, 200 hours a year, it would be cheaper for you to fly your own airplane rather than to rent one. If you maintain your airplane in good condition, you

"If the airplane has not been licensed recently, go to any FAA approved repair station . . ."

A new look at a favorite old question: Can the average private pilot really afford to own his own light airplane?

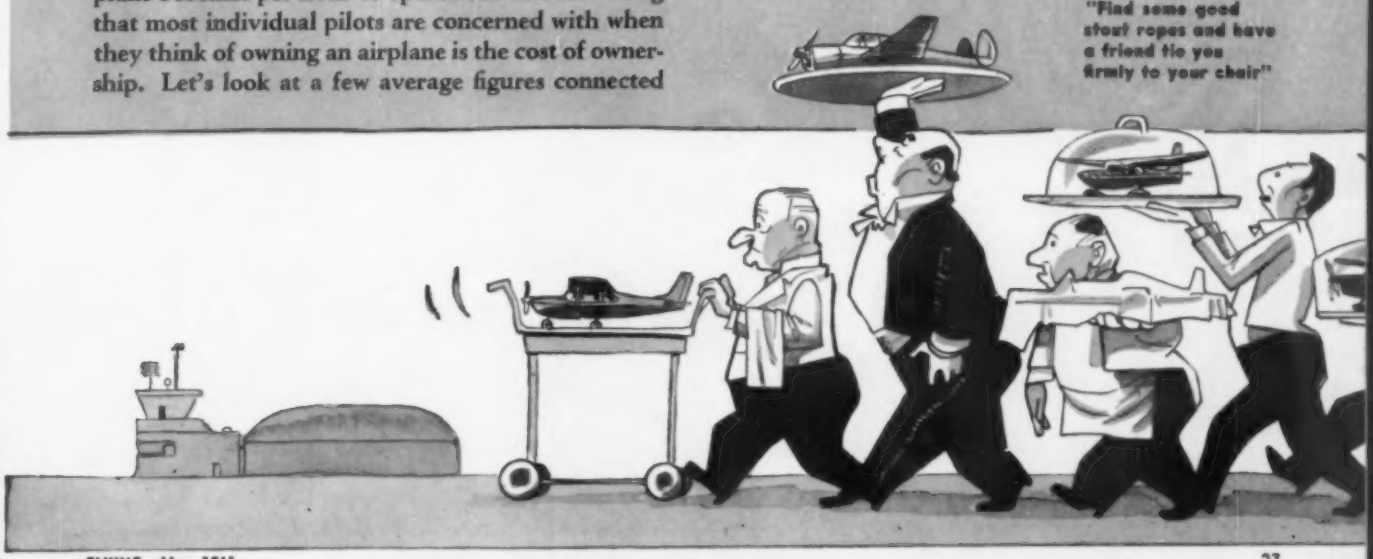
By RICHARD BACH

can very often sell it for just as much as you paid for it. Many aircraft go from year to year with very little or no depreciation, and if you like to look at the long run, it is more economical to own than to rent if you would fly your airplane more than two hours each week.

The more you use it, the less expensive your airplane becomes per hour of operation. The first thing that most individual pilots are concerned with when they think of owning an airplane is the cost of ownership. Let's look at a few average figures connected with the cost of owning a typical two-place lightplane in the Cessna 140–Luscombe 8E category.

According to the Blue Book of average used aircraft values, initial cost for this airplane will be approximately $2,300. Our airplane burns about six gallons of gasoline per hour, at 40 cents a gallon. Oil will be a variable, but our plane uses a quart every 10 hours, at 60 cents a quart, and has an oil change of eight quarts every 25 hours. We tie our airplane down on the line outside the hangar with the other aircraft, which costs about $15 a month. We are required to have a periodic inspection of the engine every year. This could cost anywhere from $75 to $250 when done by an FAA approved repair station; let's say that ours costs $120 a year, so we can allot $10 per month for maintenance costs.

Insurance costs can vary greatly, from nothing at all if you don't mind taking *(Continued on page 79)*



"Find some good stout ropes and have a friend tie you firmly to your chair"

Adieu ye winter winds and
ghostly snows!
Blow as ye will and how or
why ye choose!
I'm wearied of your sullen
tenantry
Which from Siberian steppes
is thrust on me.

I know where near the earth's
great girth there lies
A verdant isle upthrust to
sunbathed skies,
A stormless shore embraced
by cobalt seas
With coral etchings like a
temple frieze.

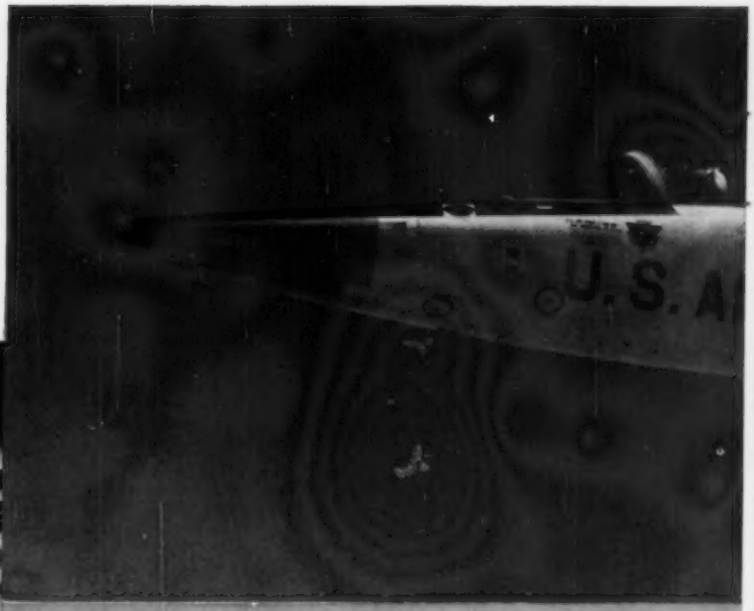
I will a'wing and thread me
down the main,
To swing in lazy circles
once again,
Above the fronded fingers of
the land
Which offers me such wealth
of contraband.

I'll feel the healing of its
symmetry—
The slow paced cloud, the low
pressed land, the sea,
The quiet bays, the surf on
noiseless feet,
And time but creeping in the
shaded street.

Adieu ye winter winds and
ghostly snows!
Blow as ye will and how or
why ye choose!
I know where near the earth's
great girth there lies
A verdant isle upthrust to
sunbathed skies.

GILL ROBB WILSON

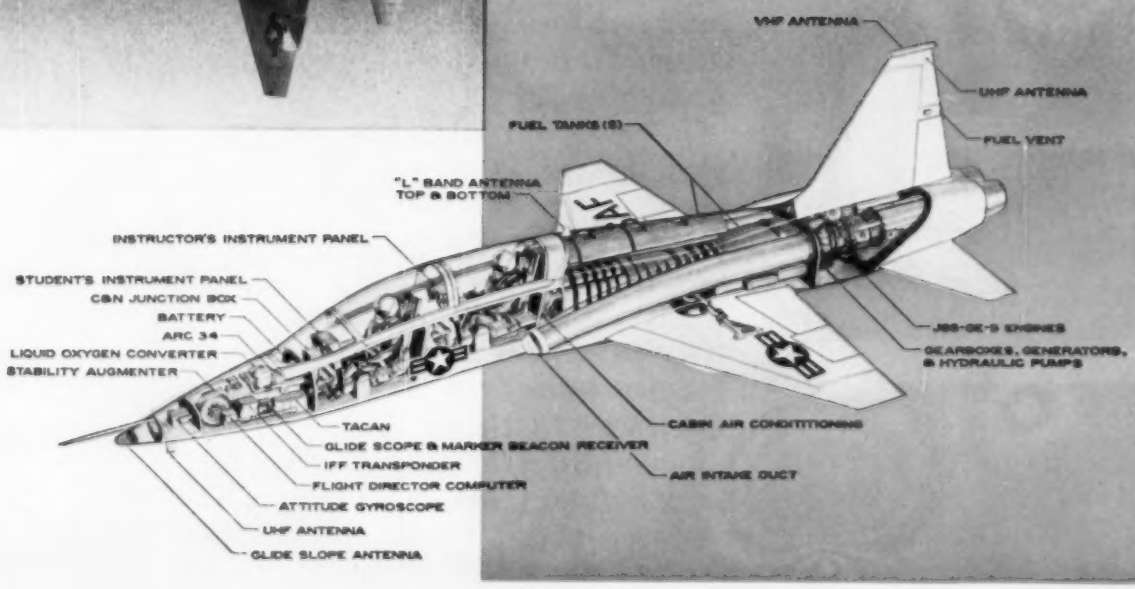
Below: Talon's instrument panel is less cluttered than tactical fighter aircraft's, emphasizes two-tone, grid-lined attitude indicator. *Center:* The pronounced area-rule fuselage of the T-38 made itself known in speed run with FLYING's pilot. Aircraft nudged over Mach 1.24 guaranteed by Northrop. *Bottom:* Cutaway view shows interior well filled with fuel, electronics equipment.



PILOT REPORT

The T-38 is the fastest, highest-flying trainer of any air force. Here's a pirep on an airplane you can safely call "hot"

By RICHARD SWEENEY



The Talon's sharklike profile is an indicator of high performance; the sleek aircraft climbs from runway to 32,500 feet in two and a half minutes.

NORTHROP'S T-38 TALON

PERFORMANCE CLOSE to that of the latest model fighter aircraft is not usually an inherent feature of aircraft designed for the basic training mission in this highly specialized era.

Northrop's T-38, however, is an exception. It is supersonic straight and level; it has a rate of climb with the best of the fighters; it can maneuver as well as any. The performance was gained by thorough application of the latest aerodynamic and structural technology in design and fabrication rather than adding more power. Most importantly, at no place were safety, inherent stability and good flying qualities compromised—they always came first.

Flying the T-38 is an enjoyable experience. It is made so by a combination of factors rather than any one outstanding quality.

The cockpit is convenient. All controls are handy; nothing he needs to reach is aft of the pilot's shoulders.

The instrument panel, which easily could have become cluttered on a twin-engine training airplane, is logically laid out. The primary flight group is centrally arranged in a T configuration, while engine gages are to the right, giving an excellent impression to peripheral vision when a normal instrument panel scanning pattern is used.

Walkaround inspection of the T-38 is simple and straightforward. The key is general condition of the exterior, struts, tires, surfaces and structure. Systemswise, the airplane should be completely dry —any sign of fluid around plumbing means a malfunction. There are three sight gages to be checked: flight control hydraulic system reservoir, utility hydraulic system reservoir and brake emergency system hydraulic reservoir. All are easily checked through access panels which are fastened so that they can be opened by finger pressure rather than requiring a screwdriver or coin.

FLYING'S evaluation flight was made from the Palmdale, Calif. facility of Norair Division of Northrop Corp. Norair fabricates main components and sub-assemblies of the T-38 at its Hawthorne, Calif. plant, then trucks them to Palmdale for final assembly and flight test.

Aircraft used was USAF T-38A 59-1603. It was the first completely production aircraft to fly, using production models of the General Electric J85-GE-5 turbojets which develop 3,850 pounds of static thrust with afterburners. The airplane had made only one flight prior to the FLYING evaluation, which was performed during the second production test flight. Norair chief *(Continued on page 68)*

Smouldering rivalry between these two major Texas cities fans the flames of a longstanding dispute

The great Fort Worth Dallas controversy

By JAMES H. WINCHESTER

IN KEEPING WITH the Texas tradition of doing things in the grand style is an airport controversy of epic proportions between the booming metropolises of Fort Worth and Dallas. Involved in the 21-year-old dispute between the neighboring cities are two of the nation's most modern commercial facilities—Fort Worth's Carter Field and Love Field at Dallas—not to mention the public welfare and high financial stakes.

Once separated by almost barren wasteland, the stretch between the two cities is now being rapidly urbanized. In a very few years, say city planners, it will constitute an almost unbroken, built-up bridge of industrial and residential sections, making Dallas and Fort Worth one integrated area.

Despite this welding together, the two centers remain deadly rivals.

Civic pride reaches major proportions. In no area is this more emphasized than in the long and costly intercity feud over commercial air transportation.

Instead of joining hands—as long urged by the Civil Aeronautics Board and the airlines themselves—to promote and serve air travel on an area basis, both Fort Worth and Dallas have insisted on going off on their own, doggedly building individual facilities. When the two major airports were built; both were difficult to get to. Now both are easily accessible, via divided highways, to residents of the vast urban region around both communities.

At the moment, Dallas—statistically, anyway—is way out in front and running in this airport Donnybrook, but Fort Worth, hollering "foul" at every step, is fighting back like a wounded bobcat.

Love Field, located in a densely-populated and built-up residential and light industry area, with little or no room for future runway expansion, is five-and-a-half

Amon Carter Field, built in 1953, is midway between the neighboring cities.

Love Field, five and a half miles from downtown Dallas.

miles from downtown Dallas. It is served by six scheduled airlines—American, Braniff, Delta, Continental, Central and Trans-Texas Airways. A seventh, Mexicana Airlines—an affiliate of Pan American World Airways—started non-stop jet service from Dallas to Mexico City in April. Love Field's seven and a half million dollar passenger terminal, just two years old, is one of the nation's finest. As a private and business plane flying center, the airport is rated by the FAA as the country's third busiest for itinerant activities. In all, about 750 planes—airline, business and private—land or take off there daily.

According to FAA figures for 1959, Dallas ranks eighth among major U. S. cities in scheduled aircraft departures with 63,095, and ninth in total passengers emplaned, with 1,177,539. In air mail volume, Dallas ranked sixth in the United States, with 5,728 tons and sixth in air cargo, with 19,191 tons. During the first six months of 1960, Love Field had 32,086 airline departures with 669,169 passengers, an increase of 4.9 and 21 per cent over the same period in 1959.

The new Amon Carter Field—Greater Fort Worth International Airport—is located 18 miles out of town, on 1,780 acres of land incorporated into the City of Fort Worth. Opened in 1953, it is in a sparsely built-up area. There is ample room for runway and facilities expansion on all sides. Located almost midway between Dallas and Fort Worth, Carter Field is less than 30 minutes driving time from downtown in either city. Like Love Field, Carter is served by six scheduled airlines—the same six—but with only 89 schedules a day, as compared to 360 for Dallas.

This disparity in schedules is the current big bone of contention between the two communities.

For the fiscal year ending June 30, 1960, there were 192,744 boardings and 174,762 deplanings on scheduled airlines at Carter, a fraction of Love's totals. It's when these figures are cited that Fort Worth's partisans begin to yell "foul" the loudest. They contend that inadequate schedules force Fort Worth people to go to Dallas to catch the flights they want—particularly the jet flights.

In 1959 five-and-a-half times as many airline passengers departed from Love Field as from Carter, which had its worst year since 1954.

"A good strong percentage (*Continued on page* 84)

MAIN STREET AIRLINES

Above: Fairchild F-27 turboprop transports helped improve Bonanza Airlines business. *Right:* But DC-3s, such as this awaiting a dawn takeoff for Mohawk, do yeoman work.

The welfare and development of America's air transport depends to a large extent on grassroot carrier growth

By LOU DAVIS

TWO YEARS AGO the aviation world behaved like expectant fathers as shining new turbines and jets arrived, bringing with them great promise of growth, and economic health for the air transport industry. Today, intoxication of that period has faded with the novelty of turbines. Realism has displayed in sharp focus a long and tedious path ahead for scheduled airlines—both large and small.

It is still evident that more than jet planes are needed before a larger portion than 10 per cent of America can climb into the sky and fly on profitable wings of scheduled carriers. Many of the operational signposts passed during the last 24 months point to economic squalls ahead. The revenue dollar is in the kingpin seat and the competitive fight for its favor will be vicious and intense beyond all previous conceptions.

Although the long haul or trunk line carriers with Boeing 707s, Douglas DC-8s, Convair 880s and Lockheed Electras have for the time being captured most of the public's attention and imagination, their financial welfare rests with a more tangible fact: the basic development of national air transport rests with America's grassroot, less glamorous airline systems which operate from Main Street to Main Street with the regularity and frequency of urban bus lines and streetcars.

It is in the broad area of local airline operations that passengers for the empty trunkline jet seats must be sold. Thus the future of the big lines hinges to a large extent upon the local's health.

We must remind ourselves that trunk airlines touch base with only 150 major urban market centers of the nation. The local carriers serve more than 560 communities in 50 states. They carry mail, cargo, passengers and express to towns and hamlets which do not produce income or revenue sufficient to support this service. Uncle Sam, through CAB (Civil Aeronautics Board)

Jeep-mounted baggage conveyor speeds loading of a Mohawk Airlines Convair at Elmira, N.Y.

Allegheny Airlines' high frequency commuter service allows cut rates without reservations.

Local airlines are considering helicopters such as the Vertol 107 for short commuter flights.

and the Post Office Department antes up the difference. Such aid, called subsidy or pay for public service, is justified under logical public service concepts of good government and free enterprise.

There are 20 regional or local service carrier airlines operating over 46,000 miles of air routes daily. Last year they carried an estimated 5,600,000 passengers up to 7.6 per cent over 1959. The all-domestic airline total was estimated at 45,700,000, or 2.7 per cent over '59. All but five locals—of which two were strikebound—reported modest profits for the year ended September 30. Year-end figures are expected to be slimmer but on the profit side of the ledger.

In their quiet, unspectacular way, locals are really progressive.

They were the first to place turbine powered transports into scheduled operations two and a half years ago. Then with modest fanfare West Coast Airlines ushered Fairchild F-27s turboprops into scheduled service in September, 1958.

Just last November, Bonanza Airlines, also operating Fairchild F-27s, bid goodbye to its last DC-3 and became the Country's first operator of an all turbine-powered fleet.

In a similar modest way, local carriers have set up other fundamental standards deemed essential to progress. They are working for high frequency commuter flights between urban market centers—similar to Allegheny Airlines operations between Pittsburgh and Philadelphia and proposed non-stop flights between Washington and New York—and for city-center to city-center rights. They seek businesslike methods of computing public service payments or subsidy, so that a fair rate of return can be the logical reward for good management.

They want lower fares so that air transportation's base can be spread wider and produce traffic needed to fill now empty trunkline jet plane (*Continued on page* 62)

Light, compact engines developing high thrust are tailor-made to meet the requirements of the new breed of jet age corporate aircraft

GENERAL ELECTRIC'S EXECUTIVE TURBINES

GE studies show best utilization of CF700 engines in Sabreliner-type aircraft, 15-25,000 lbs gross wt. and 35-50,000-lb 4-engine aircraft.

By ROBERT I. STANFIELD

GENERAL ELECTRIC'S small, rugged turbines—the CF700-2B aft turbofan and the CJ610 turbojet—soon will be fitted to new corporate aircraft that will generate speeds ranging from Mach 0.5 to over Mach 1; the coming generation of fast, executive types will range in price from about $250,000 on up.

In this area—the engines are designed for aircraft ranging in gross weight from a light 8,500 pounds to 50,000 pounds—are included William P. Lear's SAAC 23 executive twin now being developed by the Swiss American Aviation Corp. (Geneva); Israel Aircraft Industry's Bedek B101C now under development in Tel Aviv, and Aero Commander's new twin turbojet which reportedly will fly next year.

The powerplants also are expected to fly with aircraft now fitted with other turboprops or competitive turbojets: the four-engine Lockheed JetStar (see FLYING for March) and McDonnell 220C; the twin-engine North American Sabreliner and the Grumman Gulfstream, as examples.

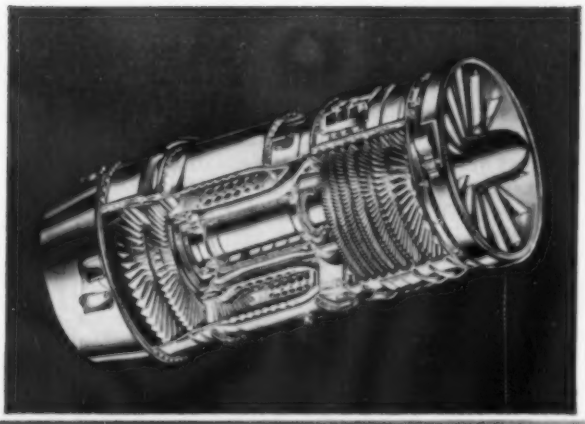
Both the CJ610 and the CF700 are derived from the lightweight, eight-stage military J85 engine, embracing a high thrust/weight ratio and built with an eye to simplicity and maintenance. The J85 now has over 20,000 hours of engine running time, including over 3,700 hours of flight at all altitudes and Mach numbers.

General Electric has been studying the turbofan since 1955 (behind the J85). About June, 1959, it decided to enter the business aircraft market and to develop a fan engine with company money. In November of 1959 the project was set up, including GE funded programs for both the CF700 and CJ610.

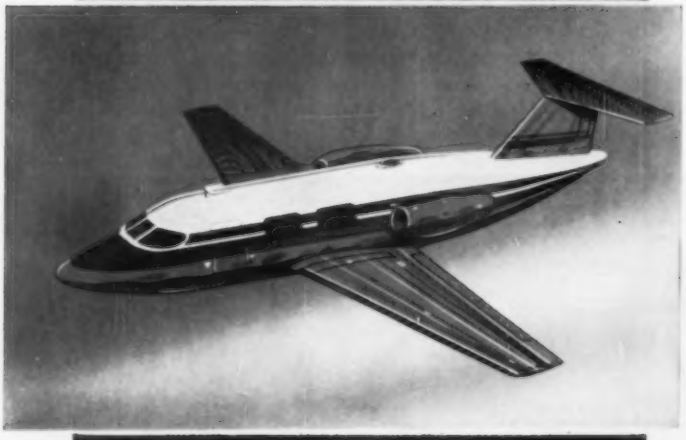
The first engine was run in May, 1960. The third unofficial 150-hour test was completed in November 1960. Flight engines are available nine months from order. FAA certification is expected during the third quarter of 1961; certified engines will be available 12 months after order.

Let's take a look at these three engines, all produced at General Electric's Small Aircraft Engine Department (SAED) at Lynn, Mass. Their varied applications include single-engine and light- to medium-twins, military utility and cargo transports, navigator-bombardier-fighter-interceptor trainers, light attack aircraft, drones, STOL-VTOL, plus applications with blown-flaps and boundary layer control.

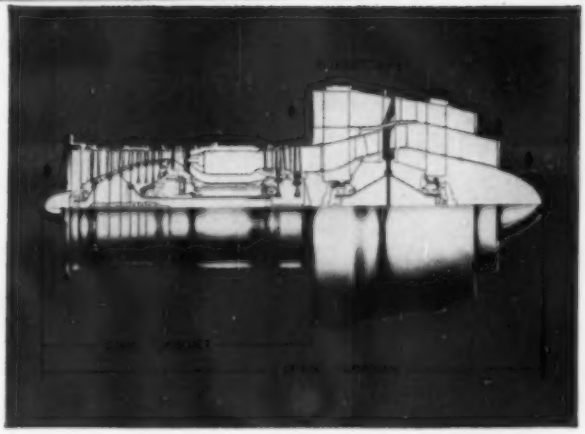
• The military J85. An advanced state-of-the-art engine, with a thrust/weight ratio of 7.6 to 1, the J85 was designed basically as a short-life missile engine in 1953. The versatile Mach-2 turbine powers McDonnell's GAM-72 Quail decoy missile and Northrop's Q-4B supersonic target drone. It did power North American's T-39 Sabreliner. It is fitted to Northrop's Mach 1.2 T-38 Talon trainer as well as to the Mach 1.45 N-156F Freedom Fighter.



Turbojet CJ610-1 is derived from the military J-85 and delivers a sea-level takeoff thrust of 2,850 pounds.



Gulfstream-type aircraft with wing sweep and pairs of aft turbofans for 500-mph-plus speed. *Left above:* Lear SAAC 23 type with CJ610s.



Also derived from the J-85, the CF700-2B incorporates an aft-fan assembly, develops a 4,200-lb thrust.

• The aft-fan CF700-2B. Confidence in the J85 led SAED to develop the then CF700-1, aimed at high block-speed aircraft in the 15,000-pound and above class. It combines the J85 gas generator (J85s are air-started; CF700s electrically started) with a simple, single-stage aft fan assembly—the scaled-down version of GE's big CJ805-23 aft-fan airline engine now flying the Convair 990.

Takeoff thrust, sea level, is 4,200 pounds, with specific fuel consumption (SFC) of .686. Weight is but 615 pounds, length 64 inches, diameter 34 inches. Bypass ratio is 2 to 1. Thrust/weight ratio is 6.8 to 1. Among the advantages offered by the aft fan are its high takeoff thrust and low SFC rating which result in improved range, payload and airfield takeoff capabilities.

• The turbojet CJ610-1 (and -2B). Also identical to the J85 and companion to the CF700 but minus the aft-fan assembly, the compact powerplant is aimed at light-weight corporate aircraft (8,500 to 14,500 pounds) which it will power from Mach 0.5 to 0.8. With a sea-level takeoff thrust of 2,850 pounds (which can be derated to 2,400 pounds—the -2B version), and a light weight of 355 pounds, the thrust/weight ratio is a high 8 to 1. The engine is only 39.7 inches long with a diameter of 17.7 inches. SFC, takeoff thrust, is .970.

Important consideration with the small turbojet, pointed out to FLYING by SAED general manager Gerhard Neumann, "is that they can be derated to most application requirements. Derated engines give infinite life, an important economy factor. The engine's light weight and smaller size is an important consideration in airframe design, especially in low-gross-weight aircraft." (See FLYING, October 1960, page 27).

While the three powerplants go up in reliability and long life (the commercial versions initially will run 600 hours between overhauls, then go to 1,000 hours) they will be coming down in price as costs decline with military orders and shipments. Some 300-plus military J85s

have been shipped to date—a figure that is expected to reach 1,000 by the end of 1961. Result is a current commercial price running from $15 to $16 per pound of thrust: $65,000 for the CF700 turbofan and $45,000 for the CJ610-1 turbojet. The derated CJ610-2 will sell for $40,000.

General Electric feels that over the next 10 years there will be a market potential of some 300 aircraft in the category that would be fitted with CF700 powerplants. These would be basically new airplanes that SAED opines could come from present owners of Convair 240-340-440 and Martin 404 class of aircraft; all likely customers for one million dollar airplanes.

Moving to the lighter type—that would be fitted with the smaller-thrust CJ610—the Lynn, Mass. manufacturer feels that the market potential, again over the next 10 years, runs from 400 to 700 aircraft, in the about-$500,000 price category.

Speculation, plus available figures, also indicate that a CJ610-powered aircraft in the 8,500- to 11,000-pound gross weight class might fall into the $250,000 to $300,000 price category. Jumping to the 12,000- to 14,000-pound class would bring costs ranging from $400,000 to $500,000.

Moving to the larger engine, a commercial Sabreliner, in the 17,000-pound-plus class, might run $800,000. And aircraft grossing over 35,000 pounds—the JetStar and Gulfstream categories—would be priced in the one million dollar-plus brackets.

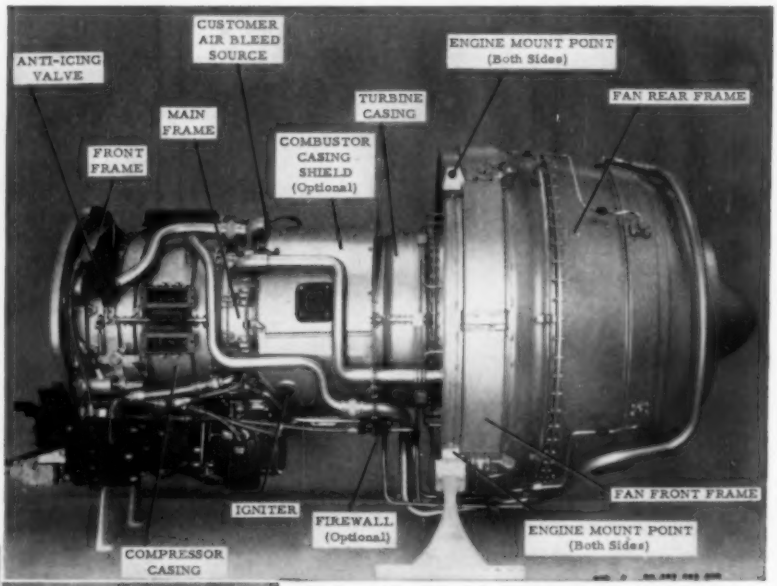
The optimum pure-jet aircraft would include a new design, rather than the configuration of a beefed-up existing airplane. Following is performance and configuration data covering aircraft mentioned earlier in this article:

• Aero Commander's new twin turbojet. Powered by two CJ610s, the aircraft reportedly will run in the 12,500-pound weight category, but the price has not yet been announced. First flight of the eight-place (including two crew) turbojet is expected to be in 1962. GE is expected to be among the first customers for this new aircraft.

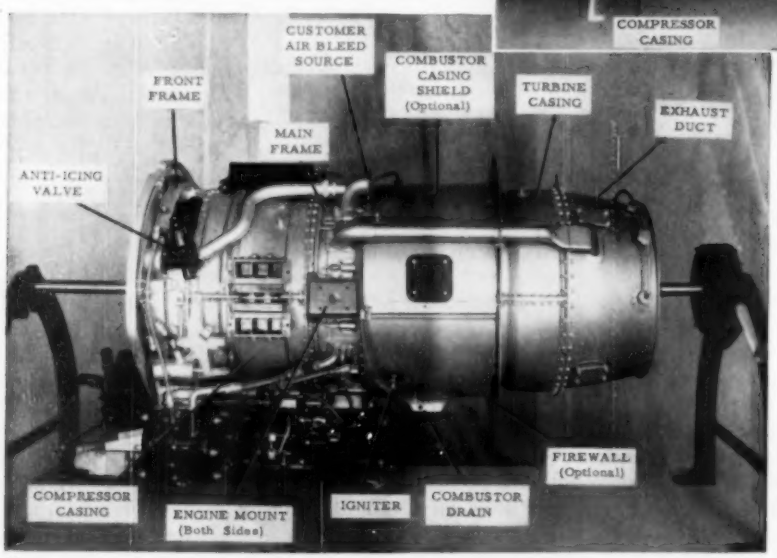
• Israel Aircraft Industry's Bedek B101C. The aircraft, designed under the supervision of Dr. Eric Schatzky along with the aeronautical faculty of the Technion (university at Haifa), will fly at 530 mph at 30-35,000 feet. The two CJ610s will be aft-mounted on the fuselage. With a gross weight not exceeding 12,500 pounds, and range approximately 2,000 miles, cost of the seven-place aircraft will run about $300,000. The prototype should fly within 18 months.

• Lear's SAAC 23. Also powered by two aft fuselage-mounted CJ610s, and with a range of some 2,000 miles, the eight-place airplane is expected to sell for about $250,000; a cost based on reported contracts with firms in Switzerland, Spain, Italy and Japan, from which components would be supplied.

• Grumman's Gulfstream. Still in the planning stage, the sleek turboprop would be adaptable for four CF700-2B aft turbofans; would probably carry wing-mounted pods of twins. While the fuselage would be retained, the wing could embrace a new configuration involving a moderate sweep, resulting (*Continued on page* 86)



Aft turbofan CF700-2B weighs just 615 pounds. Length is 64 inches, diameter 34 inches. The engine has thrust-to-weight ratio of 6.8 to 1.



Lacking the aft-fan assembly, the CJ610-1 has a diameter of just 17.7 inches and weighs only 355 pounds. Thrust-to-weight ratio is 8 to 1.

The pilot who thinks

that seeing is believing would do

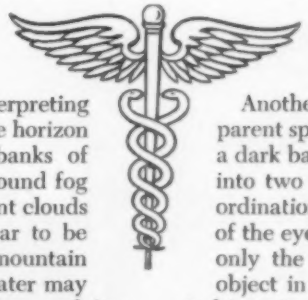
well to consider

ILLUSIONS OF VISION

By JOHN T. FLYNN, M.D.

THE PILOT'S VISION, even under instrument conditions, is his single most vital faculty in flying. Even with 20/20 sight, good depth perception, and good color vision, the best eyes in the world can play unexpected tricks on the most experienced pilot.

Eyes and brain work closely together to produce the sensation of sight; illusions can arise from the eye alone, or from the brain alone, or from a combination of the two. When temporarily "blinded" by a bright light on a dark night, the eye may take several minutes to recover, during which time the subject "sees" a persisting bright after-image. This frequent illusion of the eye itself is easily recognized and causes no serious inconvenience unless the central point of vision is affected or the light is unusually brilliant.



The brain can create illusions by misinterpreting images which the eye reports correctly. The horizon may be misjudged because of slanted banks of clouds which are clearly seen. Areas of ground fog may be mistaken for lakes and ponds; distant clouds over water and cloud shadows may appear to be islands; low lying clouds, to be hills and mountain chains. The ocean floor in clear shallow water may be mistaken for dry land. Cracks, scratches, and imbedded foreign material in aircraft canopies and windows have been mistaken for more distant objects; more than one pilot has tried to fly out of the path of a spot on his own windshield.

Eyes and brain may combine to produce many optical illusions, nearly all of which occur most easily when the visual background is uniform—fog, clouds, snowfall, thick haze, a dark night with overcast and over unpopulated areas, or whiteout conditions north of the Arctic Circle where there are no trees.

These illusions are aggravated by physical fatigue, alcoholic hangover, hunger, excessive flying, and monotony. About ten per cent of pilots have had difficulty with such illusions, very often during critical moments in approaches, landings, and in formation flying. Reliance on instruments may be necessary, but is not so effective in overcoming these errors of vision, as it is in overcoming pilot's vertigo.

An outstanding example of combined error of brain and eyes is autokinesis—that is, apparent though false movements of a light caused by the pilot's own vision. If the pilot keeps his eyes fixed on a single light on a dark night when no others are visible, after 10 to 20 seconds the light may appear to move, even when the pilot knows that it is perfectly stationary.

At first, small irregular movements appear, followed by gradually larger ones, eventually appearing to wander off into space, smoothly or in a series of jerky movements. The pathways may be straight, smoothly curved, or circular. In spite of such wanderings, the light never seems to move far from its starting point. Sometimes, the light seems to move toward or away from the observer.

This illusion of autokinesis is reported by most normal persons on about one-half of such tests, and lasts usually 10 seconds or longer. It is markedly worsened by physical fatigue, so that the light may seem to move rapidly in 15- to 20-degree arcs, like a sky rocket or a fast-moving shooting star. The effect is also exaggerated by prolonged staring at the light, by dimness of the light, and by eye fatigue.

Expectation increases the effect—a pilot anticipating a rendezvous with another aircraft may watch a light on the ground so closely that eventually it appears to move and is mistaken for the other plane. The observer's own efforts to abolish this false movement are nearly always ineffective, though helped by shifting the eyes away from the light periodically. Increasing the number of lights in the vicinity also helps—a good reason for more than one navigation light on an aircraft.

If the light itself is also actually moving, the autokinesis tends to decrease, but the combined actual and false movements of the light can lead to errors in judging its true speed and direction.

Another very confusing illusion is the sudden apparent splitting of light. A single light, alone against a dark background, may abruptly appear to split up into two or more lights, due to sudden loss of coordination of the muscles controlling the movements of the eyeballs. This double-vision appears to affect only the light, because it is the principal distant object in view. Closing the eyes briefly or looking at objects in the cockpit may restore the proper muscle balance, unless the eyes have been considerably fatigued beforehand.

Experienced pilots know that the eye tends quickly to lose its ability to report distances and depths properly. The eye is accustomed to adjust constantly to nearby surroundings and objects on the ground; this helps to maintain good depth perception. This constant adjustment is not exercised during even low-altitude flying. After an hour or so at (*Continued on page* 77)

SPERRY

INDUSTRIAL GIANT OF THE AIR AGE

Sperry Gyroscope has become the huge Sperry Rand, and still it contributes to the pilot's heritage

By GILL ROBB WILSON

PRACTICALLY all airborne equipment available at the beginning of WWII was obsolete by its end. Many corporations had been so overwhelmed by production that their research and development had suffered.

Not so Sperry Gyroscope, which had an acute consciousness in this respect. Despite pressure of production, Sperry had organized a wartime laboratory to project continuity of research. The laboratory had produced exceptional results in the pertinent fields of electronic applications, new computing methods, advanced servomechanisms and radar.

When cancellation of wartime production cut employment at Sperry Gyro from 33,000 to 5,000, the company had available this volume of fresh technology to apply to modern military support and civil air commerce.

Out of it came such equipment as the A-12 electronic autopilot, an Engine Malfunction Analyzer, the Zero Reader, airborne and marine radar, a lock-on antiaircraft fire control system, and a direct-reading Loran.

Cold War and expansion of air commerce made such products marketable. Sperry employment then began to creep up.

Outbreak of the Korean conflict posed no conversion problems. Sperry simply increased production of items already in the line and accelerated development of those still in laboratory stages. Two of the latter played vital roles in Korea—the Radar Gunsight and the Mortar Locator.

Under stimulus of this market, Sperry now purchased the entire Lake Success plant which it had previously occupied on lease from Government and temporarily shared with the U.N. It also purchased Lockheed's lease holding at McArthur Airport in Suffolk County, Long Island, thus increasing the company's logistic capability. A flight test and research center was established there to expedite engineering changes.

Unsatisfactory conclusion of the Korean embroglio brought no diminution of the Cold War—in fact rather accentuated it. The space and missile race took the center of the stage. The Sperry Gyro was fully at home in this area. The employee force rose to around 18,000 and stabilized there.

Meanwhile a radical change in the concept of military procurement had taken place. The number of "little black boxes," each representing some functional capability of airpower, had so multiplied as to impose intolerable problems. Space was lacking in aircraft to accommodate them all. Flight crews had not enough eyes, ears and hands to operate them all. Nor were there enough ground crew specialists to maintain their multitude. Furthermore, manufacturing processes had been slowed down by the necessity for redesign, modification and retrofit.

The conclusion was inescapable that the little black boxes must be wedded into systems and miniaturized. Future aircraft must be designed around the systems. Thus did the "weapons system" concept come into vogue.

Effect of this change in military procurement policy was drastic to the aircraft industry. A prime contractor for an airpower weapons system, be it bomber, fighter,

The controls for Sperry's A-4 radar bomb-rocket-gunsight occupy the top third of the instrument panel on North American's F-86F Sabrejet.

transport, trainer or what not, must now assume an engineering, financial and management responsibility beyond anything hitherto known in industry. Sub-contracting became almost a science.

The challenge to Sperry Gyro was no less than to any other component of the industry. However, the forte of Sperry had always been in the intricacies of technology. Sperry was born with wheels in its head. The continuity of wartime research in electronics and computing methods had kept them abreast of advancing requirements. The company was prepared to be a prime weapons system contractor or to assume partnership with almost any other prime contractor.

What Sperry did need was realignment of organization to define more clearly the various areas of engineering and products service. As finally decided upon, these divisions were Air Armament, Aeronautical Equipment, Surface Armament, Countermeasures, Marine, Electronic Tube, and Field Engineering. Presently they are housed in a number of different plant sites throughout Long Island with administrative headquarters at the Lake Success plant.

Harry F. Vickers has been president of Sperry Rand Corporation since 1955.

In more than a half century of operation, Sperry Gyro has been led by a half dozen different presidents beginning with Elmer Sperry (1910-'28), Thomas A. Morgan (1928-'32), Reginald E. Gillmor (1932-'45), and Preston R. Bassett (1945-'55), Charles M. Green (1955-'57), Carl G. Holschuh (1957-'58), and Carl A. Frische (1958-).

Each of these leaders except Green has himself been a product of the company as truly as any of the mechanisms Sperry Gyro produced. And they are in turn but symbols of a science-engineering roster constituted of many thousand long time professionals who successively through the years have devoted lifetimes to Sperry Gyro. In fact, as one delves deeply into the story of this company, he comes to think of it more and more as a patriotically and scientifically stimulated community than as a manufacturing enterprise. The ghost of that "most useful citizen," who founded this airwise giant walks unmistakably still in matters of motivation, philosophy and intellectual curiosity.

Perhaps this accounts for the long list of wise management and engineering decisions which have guided Sperry in threading the troubled years of its history; in fulfilling its role as a defender; in maintaining its vision of the national requirements of tomorrow. Certainly its story is one of the most striking of all examples of the effective partnership of government and industry in maintaining the sovereignty of a free people through free enterprise.

And now in concluding our series of articles on Sperry Gyroscope, we must turn to sketch briefly the whole of which it is presently become a corporate part—the vast and far flung Sperry Rand Corporation.

In 1955, Harry F. Vickers, President of Sperry Corp, and his old friend, James H. Rand Jr., President of Remington Rand, decided after long consultation to combine the two giant companies in the conviction that each had something to complement the other—Sperry Corp an unparalleled role of partnership in the technology of national defense inclusive of depth in electronics, hydraulics and automatics; Remington Rand, a world-wide reputation and sales organization in business systems, including electronic computers. This is an oversimplification of the contributions each had to bring to the half-billion-dollar union but must suffice in place of the volume which would be required to describe the variety of products manufactured in 54 different plants in the United States and (*Continued on page* 59)

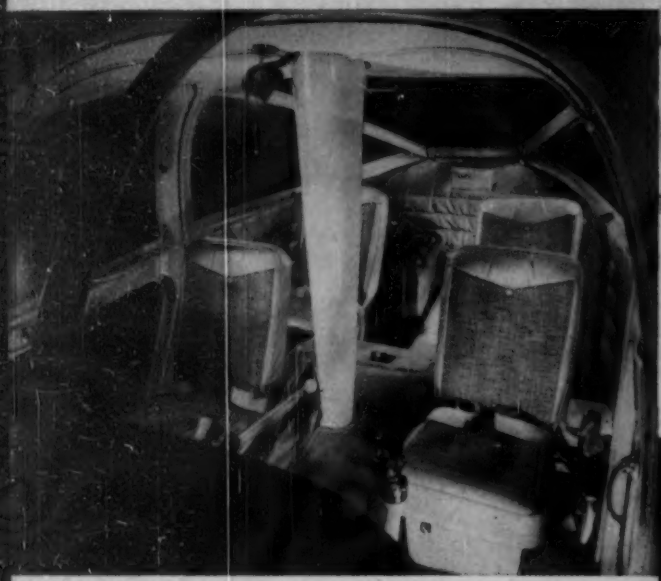
Below left: Dr. Carl Frische, president of Sperry Gyroscope Company, with the "stable platform" used in the X-15 to explore the edge of space. *Below right:* Sperry's bombing-navigation console aboard the Convair B-58 *Hustler*. The system can air-launch a ballistic missile.

PILOT REPORT

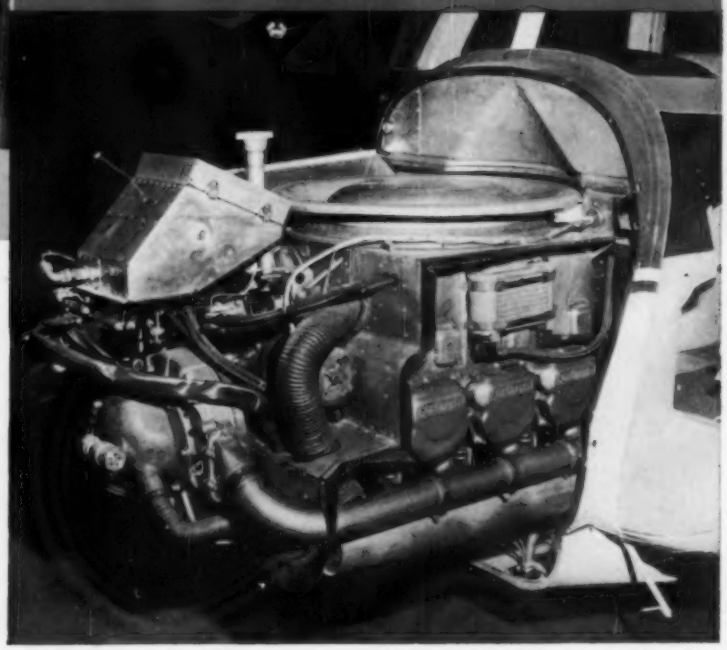
CESSNA'S SKYHOOK

This first IFR certificated rotorcraft set three world altitude records, comes in utility and plush executive versions

By GERALD J. SCHLAEGER



Above: Cockpit layout. The controls are hydraulically boosted. A gyro helps to maintain stability through the cyclic controls. *Left:* Four-place cabin has full circle visibility. Baggage space is behind rear seats. Reclining front seats adjust fore and aft. *Below:* A removable fibreglass nose cowl shields the 270-hp Continental engine. Time between overhauls currently is 600 hours.



CESSNA'S INITIAL ENTRY into the rotary-wing field—its four-place, 122-mph Skyhook—is a highly maneuverable aircraft with pronounced inflight stability plus the capability for "hands-off" flight. These features were evident to this pilot-editor in areas including that of light turbulence.

The Skyhook, evaluated by FLYING at the company's Wichita, Kansas, facilities, was the first rotorcraft to be certificated for IFR operation (in June, 1960). The early military version—the CH-1—in 1955 made the first landing and hovering tests on Pike's Peak in Colorado. In 1957 the aircraft established three world altitude records in two weight classes by climbing to nearly 30,000 feet.

Cost of this aircraft—the first of a family of rotary-wing aircraft to be marketed by Cessna—is $79,960 Deliveries of production models will begin in June. The rotorcraft is aimed largely at the short-range, executive-transport market, felt by Cessna to be particularly fertile because of the complete field support offered by the company's world-wide, dealer service organization.

Grossing a maximum of 3,100 pounds, with an empty weight of 2,080 pounds, it will be offered in two versions: the plush executive transport and the utility version geared to pipeline and exploration work, dusting and spraying, personnel carrying, etc.

Simplicity, long-life and ease of maintenance mark the Skyhook. Engine life (time between overhauls) is currently 600 hours; that for the tail rotor is 250 hours. The main rotor blades are presently set for 1,000 hours. Greasing is required every 12.5 hours; an engine oil change at 25 hours. Cessna has its sights on 1,200-hour components so that overhaul times will coincide.

The Skyhook is powered by a supercharged Continental FSO-526A six-cylinder engine rated at 270 hp at 3,000 rpm at sea level, and at 270 hp and 3,200 rpm at 8,000 feet. Horsepower rating is after cooling and at the driveshaft.

The engine is mounted flat in the nose and encased in a fibreglas, quickly removable cowl. Six snap fasteners and one quick-disconnect for the landing light allow the entire nose cowl to be removed, exposing the engine, cooling fan, supercharger and accessories.

The engine shaft is connected directly into a centrifugal clutch and free-wheeling unit. The clutch starts to engage at 1,200 rpm and is usually fully engaged at 1,500 rpm. Minimum idle speed with the clutch engaged is 1,400 rpm. The magnetos are equipped with a two-position spark control to facilitate easy starting, yet have the proper advance for operational rpm's.

The Skyhook has a top speed of 122 mph and a normal range of 260 miles. The landing gear's stainless steel tension straps absorb shocks.

The landing gear is of standard skid type. It is attached to the fuselage by stainless steel tension straps which absorb the shocks of any unusual loads. They will withstand a dead drop from five feet, with full-down collective pitch, states Oliver Hopkins, Cessna rotary-wing specialist. A float-type gear is under development, as are hoist and sling provisions.

A blue and white Skyhook, N5748, was provided for FLYING's evaluation; it has a "cocky" look on its skid gear. It is mobile through detachable wheels carried as loose equipment.

Three factors are im- (*Continued on page* 88)

With two engines and a panel of instruments, your light twin can safely fly through almost any weather

TWIN-ENGINE

Author Dawson Ransome and his Aero Commander 520 are well versed in IFR flying.

By J. DAWSON RANSOME

THE ULTIMATE in a flying career is to be a good instrument pilot. You not only satisfy yourself, but it enables you to operate your aircraft many more days of the year, and definitely a lot more safely than if you are restricted to VFR flying. It has been my experience that it is a rare occasion when on a flight in excess of 300 to 400 miles, that instrument or marginal weather is not encountered somewhere.

Although in the next few paragraphs I will briefly outline knowledge gained from my experience of over 20 years of flying, in no way do I want to create the impression that a vast amount of experience is necessary to be a proficient instrument pilot. I would rather leave the impression that a good healthy respect for your personal limitations and the limitations of the aircraft are of prime consideration.

Keeping this in mind, I hope to show how an orderly progressive approach can be taken to obtain the proficiency necessary today to successfully operate under instrument conditions throughout the country. This can be done after your instrument rating is obtained by self-imposed higher minimums until proficiency and good understanding of weather exists.

The fact that minimums for a straight-in ILS approach with glide slope to Runway No. 4 at Newark, N. J. is 200 feet and a half mile visibility, should in no way encourage a recently rated instrument pilot to attempt an approach of this type until he is certain he has the ability and background to successfully accomplish it. Legally, it can be attempted. However, unless a number of low approaches have been recently made and the pilot has a considerable instrument background, it is ridiculous to try an approach of this type, especially in a high density area such as Newark.

As a private or businessman pilot, you can eventually accomplish this type of an approach by limiting yourself with respect to weather minimums and gradually working down to lower minimums as proficiency, self-confidence and weather understanding are achieved.

Not unlike many people who are flying today, I started in light type aircraft in the late '30's and have progressed through the many phases of flying, all of which offer one challenge or another.

The procedures involved in instrument flying today vary greatly from those of 10 to 15 years ago. It is these procedures that I will dwell on extensively later in this article. I would like to point out, however, that even with all the past experience that I have had, it is my feeling that properly approached, the problem of learning weather and its effect on aircraft in flight and increased personal proficiency can be learned in a relatively short period of time by the private and business pilot who cautiously and progressively increased his proficiency along with a full understanding of the vastly more complex problem of learning modern day procedures.

There is usually more time than you realize to make decisions when flying instruments, particularly if you make every effort to plan ahead and anticipate problems prior to their presenting themselves.

A few examples of this would be, prior to takeoff on an instrument departure, make sure you clearly understand ATC's clearance and setup radios on or close to the desired frequencies for the stations to be utilized

during this phase of the flight. Preset omni azimuth indicators so that there is a minimum of cockpit work just after takeoff and during the transition period from VFR to IFR flight. There is no phase of instrument flight where some degree of pre-planning cannot be utilized to enable the pilot to devote maximum time and concentration to the control of the aircraft. If this pre-planning is carried out systematically throughout the flight, it will practically eliminate the necessity for quick and sometime costly decisions and will result in a much more relaxed atmosphere in the cockpit.

The night before I have a flight I refer to my Jeppesen Manuals and lay out the route I am going to take. It is wise to check your manual for the preferred departure and approach routes. This will minimize the chance of ATC changing the routing. After the route has been chosen, fill out a complete flight log of the type supplied by Jeppesen.

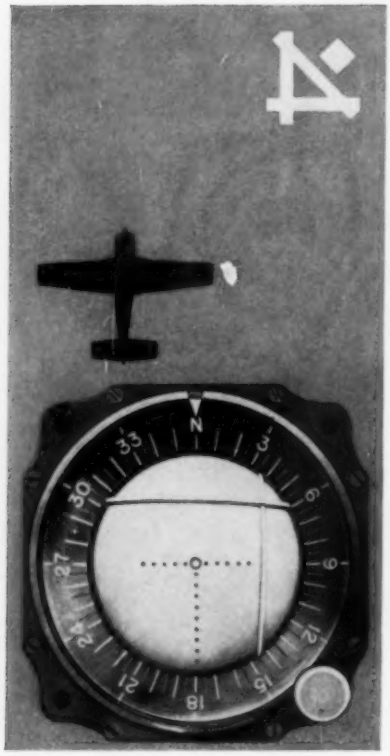
A complete knowledge of the routing prevents confusion in the cockpit at a time when you need maximum concentration.

A complete and thorough weather check should be made prior to any instrument flight. The more familiar you are with the weather to be encountered along the route, the more time you have to pre-plan and anticipate what steps have to be taken to prepare the aircraft for entry. During the winter months, and particularly on an instrument flight, all de-icing equipment available on your particular aircraft should be checked thoroughly during pre-flight inspection. Regardless of the type, make sure they are all working properly. Don't forget to check the pitot heat. It's next to impossible to fly instruments without airspeed indication. If you don't have ample de-icing equipment to assure a safe flight through the type of ice forecasted, stay on the ground.

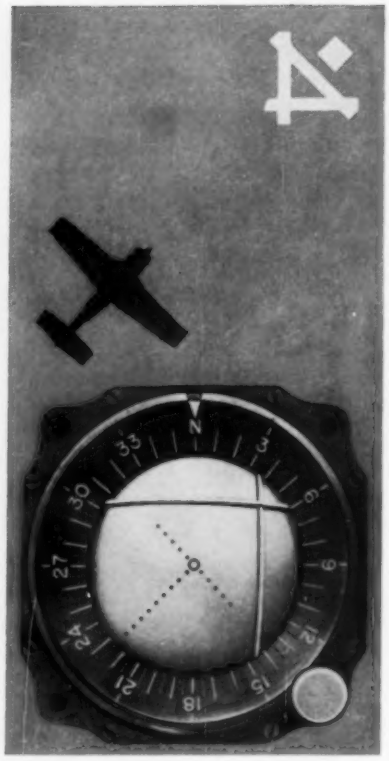
In the summer and fall months, obtain all possible information about thunderstorms and particularly the cold frontal type. Check with airline or other pilots who have come through the front. They can advise you as to the degree of precipitation, hail, and turbulence. If they report moderate to heavy precipitation, hail or turbulence, you should again pre-plan.

Before entry into heavy precipitation, you should apply carburetor and pitot heat, and if necessary increase rpm in order that there is sufficient cylinder and exhaust temperature for safe engine operation and ample available carburetor heat.

If moderate to heavy turbulence is reported, prepare the aircraft prior to entry. Reduce airspeed one-quarter to one-third if necessary. This reduction prevents excessive structural loads from being imposed on the aircraft and discomfort to the (*Continued on page* 72)



The aircraft is represented by dotted lines. Destination appears as intersection of rods.



Aircraft turned to destination. Vertical rod shows desired track; horizontal rod, distance.

BUTLER'S VECTOR

Select any point as your destination. This instrument will

THE VECTOR ANALOG Computer, (VAC), designed to solve the mounting traffic problems confronting modern aviation, was evaluated by FLYING over pre-selected courses from La Guardia Airport, New York. In flying VAC, an analogy that fits very well was supplied by E. Stuart Perkins, Chief of Butler Aviation Research, and the man mainly responsible for the computer's development. VAC is very much like the progress of the aircraft over a railroad track to a pre-determined destination. And here we begin to see where the potential of this new instrument really lies.

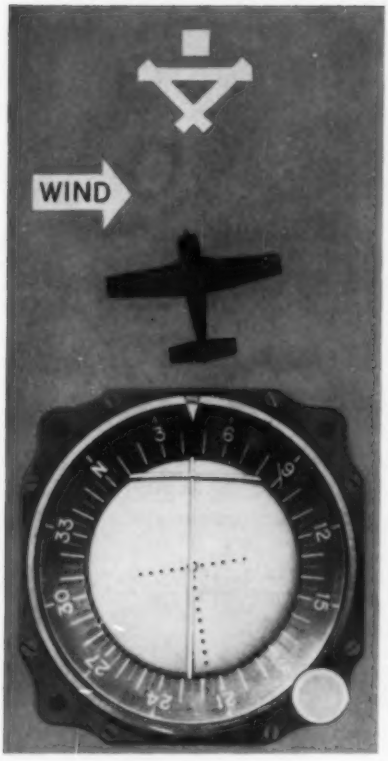
By providing aircraft of varying speed categories with their own *tracks*, laterally separated, much of the delay and congestion caused by slower, piston-driven climb-outs and descents over jet routes can be eliminated. Controlled lanes, parallel to existing Victor Airways, using existing FAA radio installations, would lead to a more expeditious handling of traffic in and out of airports. This would avoid the inherent dangers involved in what Senator A. S. Monroney, Chairman of the Senate Aviation Subcommittee, calls "traffic moving through the pipe." By supplying the pilot with accurate position information on or off airways during an uninterrupted instument scan, a fuller utilization of airspace cannot help but result.

With VAC mounted on the instrument panel the pilot has the ability to choose any geographical point within a TACAN or VORTAC area (FAA adoption of military TACAN in combined use with very-high-frequency omnirange (VOR) and distance-measuring equipment (DMET)) and treat it as he would the station itself.

A product of the Butler Aviation Research Division of the Butler Co., Oak Brook, Ill., the Vector Analog Computer commenced its development over five years ago as a course director for a pictorial type display. The presentation on the instrument, however, gave such a fine pictorial read-out that the display became merely an accessory.

Unlike pictorial displays, VAC is of standard instrument size and can be incorporated readily in the pilot's instrument scan under IFR conditions without averting his eyes from the panel to a map.

Operating from the VORTAC/TACAN input of only one station, VAC can navigate all aircraft from jets



The knob rotates destination to zero azimuth and solves wind vector for a direct course.

Destination reached when rods cross over aircraft. Computer utilizes TACAN/VORTAC.

ANALOG COMPUTER

guide you there and show range and bearing

By A. C. BASS

to helicopters while supplying position, bearing, distance, and groundspeed information and can be flown manually or used as progressive data to be fed into an automatic pilot.

The evaluation was flown in two phases. The first was to ascertain the accuracy of the eight-pound VAC (weight in production models is estimated at four pounds). The second was to use VAC in conjunction with the 22-pound pictorial display unit. Both pieces of equipment were aboard the Butler-owned Model 50 Beechcraft that featured a full panel of standard instruments as well.

VAC, a compact unit even in its flight test configuration, consists of a drawer style computer mechanism which can be pulled out for adjustment and the standard-sized indicator. This portrays the aircraft at its center as a series of dotted lines 1/10 of a radius apart. The intersection of two rods becomes the destination, with the vertical representing the aircraft's track and the horizontal its distance to go.

The sensitivity of the rods is controlled by a knob in the lower right hand corner of the computer panel. By dialing the knob, the face of the instrument becomes an area of terrain the size of which can be broken into widths of one mile, two miles, five miles, 10 miles, and X miles (X is a variable and was set at 100 miles for the evaluation flight).

Coupled with the instrument are encoding dials upon which the destination's direction and distance from the VORTAC station can be set in. These become the Rho Theta coordinates of the destination.

Takeoff from La Guardia's runway 22 on a clear Saturday morning afforded good visual reference with the ground. This enabled us to verify the selected check points over the vectors that the computer was called upon to solve.

Our flight plan required a left turn out, climbing to 2,500 feet, and, with the Idlewild VORTAC under temporary repair, the use of Solberg as our base station.

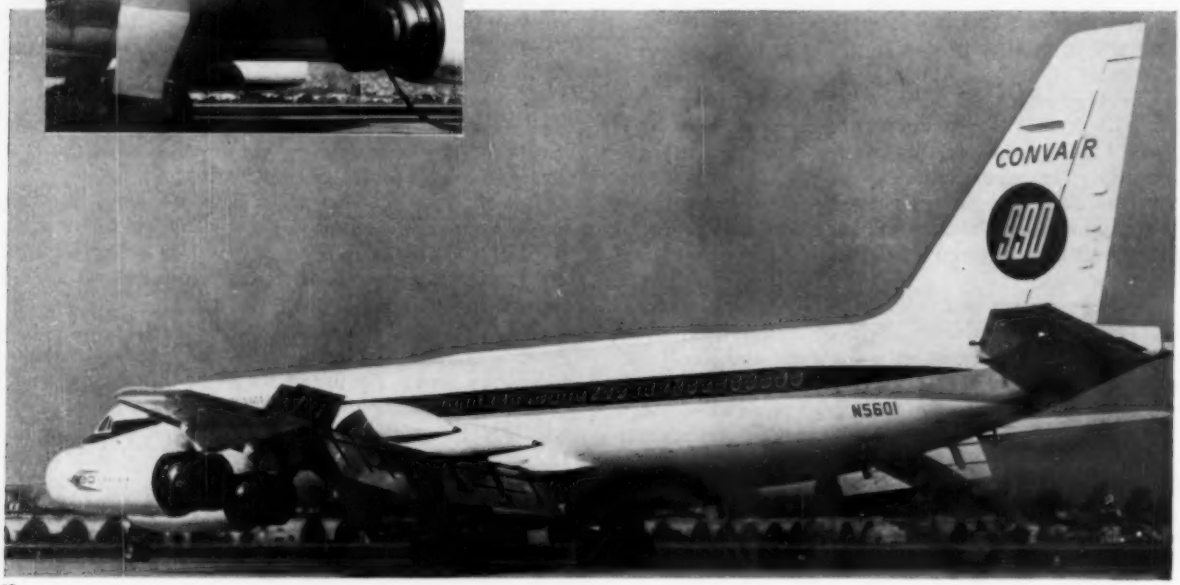
The first checkpoint was the Scotland light ship, which is also a checkpoint of inbound Idlewild traffic. Located off the Rockaway shore line, its distance and bearing from Solberg were determined from a standard navigation chart. These Rho Theta coordinates were then cranked into the computer on the encoding dials. Due to our close proximity (*Continued on page* 81)

NEWSREEL

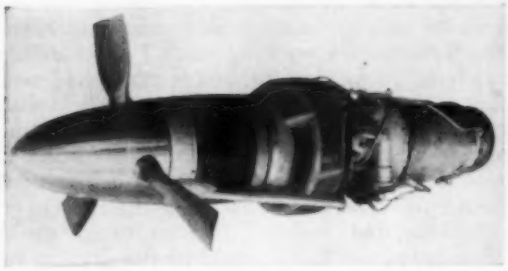
VALKYRIE *(Right)*. Al White, new chief test pilot for North American Aviation's Los Angeles Division, looks over model of the Mach 3 B-70. The SAC bomber's engines will deliver 180,000 pounds of thrust, which is equivalent to one-third the horsepower of Hoover Dam.

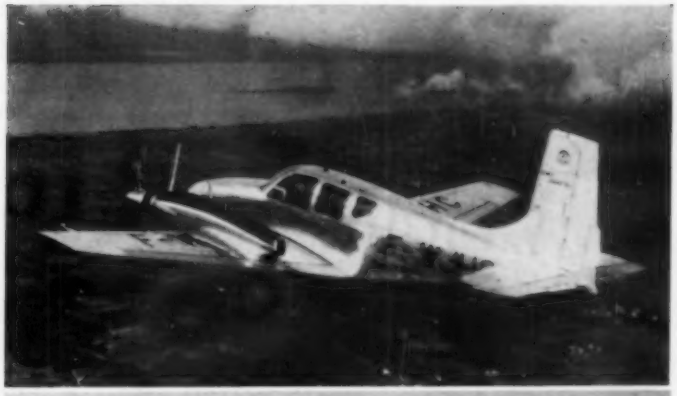
LOCKHEED TURBOFAN *(Right)*. Projected C-141 cargo plane will be able to carry a 20,000-lb. payload 6,300 miles or a 60,000-lb. payload 3,400 miles at airspeeds up to 580 mph. The military-civil freighter will operate from 6,000-foot runways, will slow to 120 kt for troop and cargo dropping. Engine thrust: 18-24,000 lbs.

CONVAIR 990 *(Below)*. Fast jet shows drag devices to lower approach speeds and shorten landing roll. Shown in operation during a taxi run at Convair's San Diego plant are leading edge slats, flaps, spoilers, and a new-design thrust reverser. Thrust reverser *(left)*, specially designed for the 990's GE aft-fan engines, reverses both the primary air (inner exhaust) and fan discharge air (outer exhaust). Engines are rated at 16,000 pounds thrust.



NEWSREEL





TURBOMECA ASTAZOU *(Above)*. French light turboprop rated at 500 ehp, has a diameter of 18 inches, weighs 270 pounds. Astazou has been flying lately in such aircraft as the Beech Travel Air *(above right)* designated Marquis and the German Dornier Do.27 *(right)* which flew for the first time with this powerplant in March of this year at Bordeaux, France. Conversion of both aircraft to turbine power was made by SFERMA of France.

FRENCH ULTRALIGHT *(Above)*. Reminiscent of the Mooney Mite, the small single seater was designed and built by Rene Fournier of Paris. Plane combines lightplane and sailplane characteristics, has single retracting landing wheel and is powered by 25-hp Volkswagen engine.

LOCKHEED SUPER 26 *(Above)*. B-26 conversion by Lockheed Aircraft Service, Ontario, Calif. to an executive transport for Mesta Machine Co. Modification consisted of lengthening and heightening of the fuselage, installation of fiberglass nose to house electronic gear and baggage compartment, cabin pressurization and bigger dorsal fin for stability.

DAMOURE SAPHIR *(Below)*. Light two-place airplane designed by Rene Damoure, chief pilot of the Aero Club d'Agen, France. Aircraft is of all-wood construction, fabric covered. Wing span, with tip plates, is 27 feet 10 inches, gross weight, 1,274 pounds. Cruising speed 118 mph.

NO. 252

I learned about flying from that!

The Boeing was a big biplane, the WASP was a small pilot. She needed just one more pillow on the seat . . .

By MARGARET ROBERTS

ON AN EXCEPTIONALLY cold day in the winter of 1943, when, as a WASP, I was ferrying a PT-26 (Fairchild) to a Royal Canadian Air Force Base in Canada, I landed for fuel and a hot cup of coffee at a large field in the northern United States. It was about eleven o'clock in the morning, and the long concrete runway was clear, but the snowplow had evidently just completed the job of clearing it, for great piles of snow, three or four feet high, lined its sides in a solid wall.

I taxied my plane over to the hangar and jumped down, asking the mechanic on duty to fill the tanks and check the oil. It was a civilian field, and there were knots of young students and instructors, bundled to the ears against the biting cold, talking earnestly and making the familiar flying gestures with arms and hands as they described their maneuvers to one another. On the line the Cubs and Aeroncas and Taylorcrafts shone blue and yellow and red in the frosty sunshine, and in the air above us others circled in the traffic pattern.

Having warmed myself with coffee I returned to the hangar to find two mechanics hovering over my plane, examining a tire. As I approached they stood up and told me they had found a nail and advised me to wait and have the tire removed and patched, which, of course, I agreed to do. Leaving them to their work I wandered around in the hangar and came upon a lovely big old biplane of a type and vintage I had never seen before. It was an old-style Boeing, still looking very airworthy on its high landing gear and somewhat resembling the Stearman trainer with which I was familiar.

A very large young man, dressed in the same heavy flying-suit as the instructors I had seen on the field with their students, came over and tenderly patted the plane and told me it was "a honey." As a matter of fact, it developed that he was just on the point of rolling it out to fly for a little while, and he asked me if I'd like to go along. I told him that I had to wait around for my tire to be fixed anyway, and that I would be delighted to go provided we could be down within a half hour.

This agreed, we pushed the plane out to the apron, had it filled with gas, and climbed in—I in the front cockpit, at his invitation, and he in the rear. My newfound friend, who for purposes of this narrative I'll call Bill, suggested that I fly it, and I happily agreed. However, as soon as I got firmly settled down in my seat and looked around, I discovered that this cockpit had not been designed with the thought of a five-foot-two pilot in mind.

My feet barely touched the rudder pedals even with my toes fully extended, and with the seat ratcheted all the way up as high as it would go the top of my head was still shy of the top rim of the cockpit sides and my eyes didn't clear it at all. In short, I was blind as a bat in there. I couldn't see anything but the cozy sides of my cockpit in any direction. This, obviously, was no way to try to fly an airplane. I hollered to a nearby mechanic who kindly provided two cushions. By putting them both behind my back I could comfortably reach the rudders, but the problem of seeing out was still unsolved. I started to call out again for more cushions, but Bill, laughing merrily, told me to "Never mind."

"I'll taxi it and make the takeoff," he cried gaily, "and when we're in the air and level you'll be able to see fine."

I waved "Okay," and off we went.

Bill made a fine takeoff, down the big runway with its thick walls of snow on either side. Sure enough, as soon as the tail came up, my visibility was excellent and, although still pretty low in the cockpit, I could peer around in all directions and see both forward and downward with a slight craning of the neck. Upon his signal I took over the controls and kept the plane in a gentle, steady climb, dutifully making clearing turns to watch for other traffic. At about four thousand feet I levelled off and throttled back to cruise and flew a bit to get the feel of the airplane, which handled beautifully and was a great pleasure to fly. Twenty minutes and a few chandelles and lazy eights later, I turned around, pointing to my watch with eyebrows raised questioningly, and pointed back to the field. Bill nodded to indicate assent and we started down.

As we entered the traffic pattern I raised both arms above my head to indicate that he was to take over, and looked around at him. He waved to me to continue flying. Cupping his hands over (*Continued on page* 75)

91 OUT OF 96

OF THE JET-EQUIPPED AIRLINES IN THE FREE WORLD USE ESSO TURBO OILS. THIS REMARKABLE ACCEPTANCE IS INDICATIVE OF THE HIGH QUALITY THAT GOES INTO ALL ESSO AVIATION PRODUCTS. NEXT TIME YOU LAND, TAXI OVER TO THE ESSO SIGN.

ESSO STANDARD, DIVISION OF
HUMBLE OIL & REFINING COMPANY

A glass aircraft covering, strong and cheap and flexible, might well displace fabric

A hog for punishment

By OLIVIA BROWNE

A GLASS FABRIC covering process, after several years of tests in lightplane covering, is said to last as long as the plane. The Federal Aviation Agency issued the first Supplemental Type Certificate for use of the process, called Razorback, on April 1, 1959. Since then, FAA has granted complete and unrestricted approval for its application on any aircraft for which Grade A cotton or linen had been approved.

Razorback is available from Planters, Inc., Blytheville, Ark., in kit form through distributors in 10 states.

The Razorback method is a combination of glass cloth and CAB butyrate dope. The cloth is pure glass. Though glass will not shrink, a tautening action has been achieved by moving the threads closer together in the weave through a patented process of pretreatment of the cloth and subsequent use of the dope.

Untreated, the Razorback glass cloth has tensile strength of 150 by 160 pounds. Treated, it exceeds 200 by 200 pounds.

Since all of the Razorback products, including cloth, reinforcing tape, rib-stitch cord and finishing tape are pure glass, the installation is permanent. It is not affected by moisture, mildew, chemicals or acids. It is fire-resistant.

Each kit contains sufficient pretreated glass cloth, glass rib cord, glass reinforcing tape and glass finishing tape for designated aircraft as well as complete installation instructions and STC number.

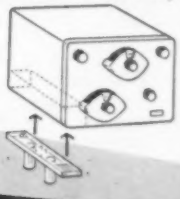
Kit prices range from $100 for an Ercoupe to $394 for a Stearman. The kit for a Tri-Pacer is tagged $256.90; for a Twin Beech, $174. END

Razorback is put to the test by inventors Paul Lloyd and Sam Macre *(left)*. Their 185-pound attorney Max Harrison does the jumping. Kneeling is Jim Files, owner of the nation's first Razorback-covered Carribean, standing serenely in the background.

NEW! 8 OUNCE *Glideslope* RECEIVER is built-in the KING KX-110 COMM/VOR/ILS PACKAGE

The Only Glideslope receiver that is—

- **Panel Mounted!**
- **Only ½ pound in weight!**
- **Built-in to COMM/VOR/ILS package!**



KN-50 VOR/ILS PACKAGE
All omni and localizer channels **plus 10 channel Glideslope receiver.** Crystal controlled. 6½" x 2¾" panel space, weight 4½ pounds, price (14V) $825.

10 WATT TRANSMITTER—3 RECEIVERS

This new addition to the *King Plan for Radio System Progression* adds ILS utility to the King KX-100 System without adding to space requirements. The entire unit is panel mounted (6½" x 5¼" face plate) and weighs only 9 pounds including a separately mounted, transistorized power supply (14V or 28V). You get all this for only **$1495.** (14V)

COMM — 90 channel crystal controlled Transceiver (118.0 to 126.9 mc inclusive), *all the channels you will ever need to operate in any terminal area* in the U.S. 10 watt transmitter power with receiver sensitivity to match.

VOR — 100 crystal controlled channels (108-117.9 mc) covers all omni and localizer channels. Separately tuned for *simultaneous* use with COMM Transceiver.

ILS — *Glideslope receiver is built-in.* 10 crystal controlled Glideslope frequencies are paired with localizer frequencies for automatic tuning.

EASY INSTALLATION! The KX-110 is the simplest and easiest to install of all COMM/VOR/ILS packages. (Almost plug-in, if you now have a KX-100.)

And a Matching
Omni
Localizer
Glideslope
Converter/
Indicator

The KING KI-210

Airline accuracy, reliability. Paired with the King KX-110 or KN50, gives you exceptional reception range on omni; switches automatically to localizer *and* Glideslope when the correct localizer frequency is tuned. Your instrument breakthroughs will be perfect centerline . . . missed approaches are obsolete with the KX-110/KI-210 System.

Size—Standard Instrument 3¼" x 3¼", 10" deep.
Weight—only 2½ pounds.
Price—only $995.00.

KING

© 1961, KING RADIO CORP.

For *complete* information and demonstration of the King KX-110 and KI-210 see your King Dealer. Write direct to King Radio Corp., if you do not know his name and location. Ask also about the new KN-50 NAV Receiver with built-in Glideslope receiver.

KING RADIO CORP.
OLATHE, KANSAS

Sold and installed by Certified Dealers in U.S. and Canada. Export by REA International, 80 Broad Street, N. Y.

Builders of TOMORROW'S Aircraft Equipment TODAY!

Navion Rangemaster

(Continued from page 25)

on. The engine will quit for several long seconds before the tip fuel reaches the fuel pump. This may be precluded by using the tips selectively on taxiing and runup prior to takeoff.

The Rangemaster retains the original Navion wing section. It is a reflex type airfoil—"washed out" at the trailing edge and coupled with seven degrees of dihedral. This explains the aircraft's excellent stability.

The wing skin is .040 aluminum sheet and the wing structure is 150 pounds heavier than required; it is a very rugged unit. To the company's knowledge, no Navion ever has had structural failure.

Sea level pressure was 29.94 with a southeast wind of 15 knots on the day of the initial flight; ground temperature was 67 degrees F. Herbert Coffman, Navion's engineering test pilot, was along on FLYING's evaluation. Thirty-five gallons of fuel brought the weight to just over 2,500 pounds for this flight; 3,150 is maximum gross weight at the present time, but a 3,500-pound gross is anticipated shortly.

Acceleration is rapid during the takeoff. The nose was raised at approximately 60 mph and the Rangemaster became airborne at about 65 mph after an 800-foot run—no effort was made to pull it off.

Initial rate of climb was 1,500 fpm at full power and this settled to 1,250 fpm with 2,500 rpm and 25 inches mp at 120 mph. A 4,000-foot ceiling precluded any high altitude work the first day, but on the second day of evaluation, the Rangemaster showed its ability to climb at 500 fpm at 10,000 feet.

Elaborate performance tests were made in conjunction with the airplane's overall test program—these were the second and third flights of the Rangemaster's life.

One hundred horsepower (2,100 rpm, 18 inches, and outside air temperature of 17 degrees C at 3,000 feet resulted in a true airspeed of 120 mph. The same horsepower produced a true reading of 134 mph at 7,000 feet and 143 TAS at 12,000 feet; fuel flow in each instance was 7.8 gph.

A true airspeed of 173 mph was attained at 7000 feet at 160 hp. (2300 rpm, 22 inches mp, and 10 degrees C) but the same horsepower produced only 162 mph at 3,000 feet with a fuel flow in both cases of 11.5 gph. It can be readily seen that the Rangemaster does its best at higher levels.

Our highest recorded cruise came with 2,625 rpm and 22 inches mp at 7,000 feet where a calibrated airspeed of 163 trued out to 182 mph; fuel flow at this power was 14.2 gph. Noise level, due to high rpm, was high.

Because of an undetermined obstruction in the Rangemaster's induction system, it consistently drew one inch less manifold pressure than the Model F, which has an identical power package. In spite of this, the Rangemaster was able to produce higher true airspeeds than the earlier airplane. Had the additional inch been available, the Rangemaster would have exceeded 182 mph by several miles an hour.

Childs and Coffman feel the Navion design has never been fully exploited—several improvements are in the offing. Wheel-

(Continued on page 56)

THE THRUST LEVER

By CAPTAIN DAVE KUHN

PILOT FATIGUE

FATIGUE SHOULD never be discounted as a contributing factor in determining the cause of accidents. It is a well-known fact that people operating machinery are more accident prone when tired than when rested. Most of our highway traffic deaths occur at the end of the day. Industrial accidents in factories and plants also are more frequent at the end of a hard shift.

Tired people are not alert and consequently do not react fast enough to prevent accidents. They might take a turn too fast, skid into a lamp pole or jump the divider on a freeway. In the exacting business of driving an airplane, a tired crew can be murder.

Every student pilot has one fundamental rule drilled into his flying habits. *Stay ahead of the airplane!* "Fly the ship, don't let it fly you." This is good instruction. It has been pretty well established that once the airplane gets ahead of the pilot, he may not have time to regain control. Second chances are not too plentiful. Without doubt, there have been many plane crashes due to the pilot being robbed of his ability to stay ahead of the plane by fatigue.

Some few years back a foreign flag airliner attempting to land at Idlewild, New York, crashed into the approach lights over the bay and burned. The investigation revealed that the crew had been on duty over 20 hours with no rest period or relief. After making several passes in instrument conditions, contact was made short of the runway. The resultant fire and loss of life can be attributed only to fatigue.

In another case, after an all-night flight, the pilot, unable to find the airport, landed in a farmer's corn field. He ran short of fuel and judgment at about the same time. Fatigue had permitted the plane to get ahead of him.

Now, with jet transports flying at Mach .9, and soon at speeds of Mach 2 (twice the speed of sound), it would appear that this is the time to overhaul the flight time limitations for pilots manning them. Present limitations were set forth as safety measures when planes flew at about 100 mph. They have remained unchanged for the past 27 years. To stay ahead of these jets, there can be little or no fatigue imposed on the pilot.

The jets have been in airline service over two years. Pilots flying them have complained repeatedly of the added work load. Many have asked for leave or permission to drop a trip each month. The incident of illness among the jet crews is more than coincidental. Chronic fatigue is not an asset in jet operations. One pilot negotiator admitted in writing: "There is an overwhelming desire for a reduction of flying hours on the jets."

Each year the "safety forum" staged by the Airline Pilots' Assn. in Chicago focuses attention to many aspects of operating safely.

Detailed papers are presented on such things as airport lighting, anti-collision lights, navigational aids, pilot training, crew qualifications, communications, fire fighting, adequate runways, traffic control, ditching and survival, "golden triangles," en route procedures, approach procedures, terminology, aircraft structure, etc.

All, or most, of this is good. Many recommendations stemming from these discussions have undoubtedly aided safety. Conspicuous by its absence, however, has been any mention of reducing the jet hours to relieve fatigue. Neither has the association's physical standards committee made any study and recommendation pertaining to the added strain jet flying imposes. There are complaints that suggestions from pilots flying jets have been rejected as merely attempts to gain some unwarranted advantage by "special interest groups."

Consequently, the entry into the jet age has not been without some rather heated feelings amongst crewmen.

In 1960 the FAA with the cooperation of the FEIA (flight engineers' union) conducted fatigue tests on jet flying much as had been done by the USAF. Oddly enough, the pilots' union had no part in the tests.

Medical centers on the east and west coasts made studies of flight engineers over a period of some months. They were a "before and after" evaluation. When the studies were complete, there was enough evidence to suggest that the action of foreign carriers and the Air Force in reducing jet flying hours is warranted.

There are indications that the FAA shortly will propose revisions in flight time limits for jet crews. It is long overdue. One FAA official stated he had long expected such a request from the ALPA. It is a welcome prospect for the jet boys. As one greybeard allowed, "Our committees have been awful busy, but busy on the wrong things—I'm bone tired."

You decide where and when you want to go. The Lockheed JetStar, world's fastest business plane, takes you there with jetliner speed, comfort and reliability. Because it operates from fields of less than 5,000 feet, it can fly direct to hundreds more airports than the big jets—and make better point-to-point time. Four Pratt & Whitney Aircraft JT-12 turbojet engines power the JetStar. Each weighs but 436 pounds yet develops 3,000 pounds thrust. This high thrust-to-weight ratio contributes to the JetStar's short field take-off, its jet-performance climb, and its cruise speed of 500 to 550 miles per hour at up to 45,000 feet. The JT-12's simple, rugged design ensures high reliability and easy maintenance. And it is backed by Pratt & Whitney Aircraft's worldwide service.

PRATT & WHITNEY AIRCRAFT DEPENDABLE ENGINES

Pratt & Whitney Aircraft
Division of **UNITED AIRCRAFT CORPORATION**
EAST HARTFORD, CONNECTICUT

(Continued from page 54)

well covers that are closed when the landing gear is retracted or locked down are expected on the production airplane. A seven-mph airspeed increase is anticipated. Work is being done on wing fairing which may also improve the performance.

The Rangemaster can be landed with full tip tanks and has been flown and spun with one tip full and the other empty.

The inter-connected controls are retained in the Rangemaster but the interconnection cannot be felt in flight. Straight flight or mild turns can be made by rudder alone—this is particularly advantageous on a cross-country when reading the map or other publications.

Landing produces no problems in this forgiving airplane; it is simply steered at the landing spot at a hundred miles per hour and flared as the surface is approached. The exact height of the flare is not critical and is either speeded up if delayed or slowed if started early. In any case if the plane is level or nose high when ground contact is made, the landing will be a good one.

Using less than 100 mph on the final approach results in a high rate of descent, so the flare must be hurried. Flaps are recommended for landing, but are not necessary. The plane has a steep angle of glide, power-off. If you overshoot in this airplane you have to be past the field before you start—with full flaps, power off, it comes straight down with no increase in air-speed.

A good deal of the drag comes through the McCauley metal propeller; at altitude, a power-off glide at 90 mph resulted in a 700 fpm rate of descent with the prop controls full back—with prop controls full forward the vertical speed increased to over 1,500 fmp.

It was with extreme reluctance that the writer returned these two fine airplanes to their owner; I had never flown a Navion prior to this, but had heard testimonials from nearly every Navion owner I had met. Apparently they become a breed all their own. According to Leo Childs, 51 orders with deposits attest to the Rangemaster's coming success—over 350 old Navion owners have indicated a desire to trade for the new version.

Company plans call for continued improvement of design in the single-engine version as well as twin-engine types. On the boards now are: a new six-place 340 hp supercharged single which is designed to cruise at 230 TAS at 12,000 feet and sell for $32,000. It is scheduled for a summer showing—the engine is already at the plant for the first one (See FLYING for Feb., page 3).

A lightweight single is planned to compete in the $15,000 to $20,000 price bracket; no tentative production dates have been announced.

Two twins are in the offing. One will have the present configuration with two 260-hp Continentals and carry a swept-tail—it is expected to cruise in excess of 215 mph. The second will have increased wing span and a larger fuselage and will be for utility operation.

All dies, jigs, fixtures and spare parts were purchased from the Ryan Aircraft Corp.; all are in place at the Galveston plant and the line is moving. Parts for 100 airplanes are on hand. Present goal is to produce five airplanes in June and accelerate to one per day in the fall.

With a proven airframe and enjoying a world-wide reputation for reliability, the increased performance available plus the coming diversified line point to the success of Navion. Attention to detail and long life will keep this well-known aircraft around for many years to come. END

PERFORMANCE

Takeoff distance with 50-ft. clearance:
- Normal takeoff at 68 mph ..... 980 ft.
- Max. effort takeoff at 58 mph .... 825 ft.

Landing Distance with 50-ft. clearance:
- Normal landing at 90 mph ..... 980 ft.
- Short field landing at 75 mph .... 750 ft.

Climb, normal at 105 mph (SL, maximum power, gear and flaps up) .... 1,250 fpm

Airspeeds (mph):
- Design diving ..... 220 IAS
- Normal Red Line VNE ..... 198 IAS

Service Ceiling ..... 20,500 ft.

Absolute Ceiling ..... 22,400 ft.

POWER SPEED

	BHP	TAS	Fuel Flow (Gal./hr)	Range
Max. continuous (SL)	260	194	21.2	
Climb (SL)	260	105	21.2	
Best economy cruise 12,000 at 50%	130	177	9.8	1,858 miles
Normal cruise (7,500 ft. 65% BHF, 30 min. reserve)	169	181	12.5	1,475 miles

SPECIFICATIONS

Type Certification—Normal category, private non-scheduled or cargo operation, no acrobatics.

Engine—Continental IO-470-H 260 hp at 2,625 rpm.

Fuel capacity (gallon)—40 main, 34 each tip (total 108).

Octane—100/130.

Propeller—McCauley, constant speed, hydraulic.

Airframe—Low wing, all metal.

Gear—Tricycle, retractable, hydraulic.

Length—27 ft. 6 in.

Height—8 ft. 6 in.

Wing span—34 ft. 6 in.

Weights:
- Max. takeoff ..... Present 3,150 lbs.
  *Future 3,500 lbs.
- Max. landing ..... Present 3,150 lbs.
  *Future 3,500 lbs.
- Empty ..... 1,950 lbs.
- Useful ..... Present 1,200 lbs.
  *Future 1,550 lbs.
- Baggage Compartment ..... 180 lbs.

*(Increase is pending with FAA)

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- Artificial Horizon
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Engine Instruments:
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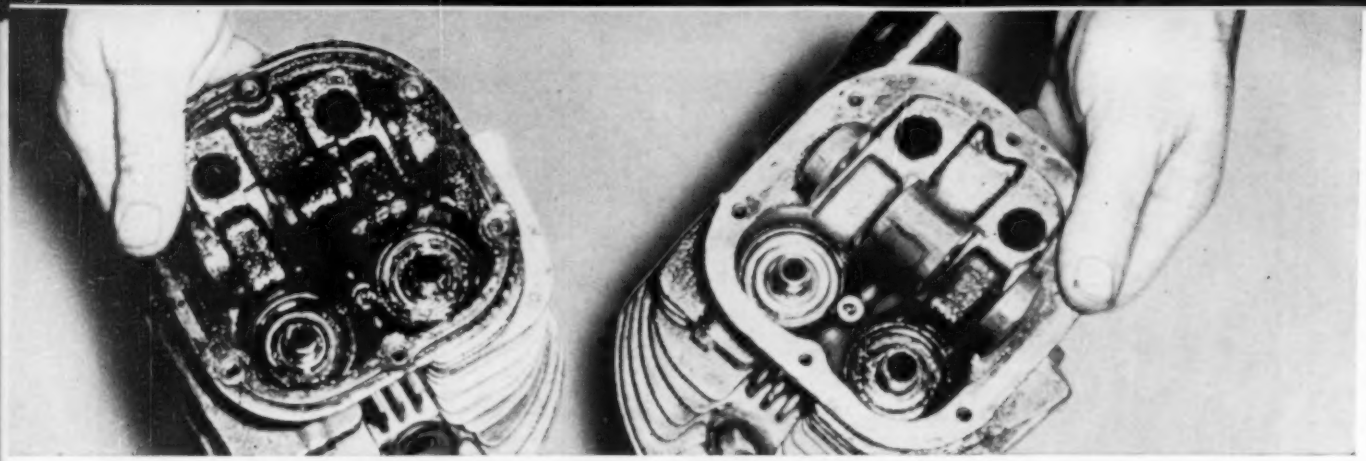

Dramatic proof of AeroShell Oil W stability. Rocker box section (left) ran for 250 hours using a good straight mineral oil. Rocker box (right) ran over twice as many hours on AeroShell Oil W. Note remarkable cleanliness.

BULLETIN:

Shell answers the ten questions you might ask about AeroShell Oil W—world's first non-ash dispersant aircraft oil

Less oil consumption. Longer intervals between engine overhauls. Easier starting, faster warm-up, reduced wear on piston rings, cylinder bores, cam lobes, lifter faces, gears and bushings.

All these benefits have been obtained with new AeroShell® Oil W. Here, in handy question-answer form, are the facts.

1. What types of aircraft can use AeroShell Oil W? Piston engine planes of any size. Helicopters, too.

2. Why is it called a non-ash dispersant oil? Because it contains special additives that help keep tiny, ingested particles in the oil from clumping together and forming deposits. These particles remain suspended and dispersed until they burn.

3. How does this effect engine performance? It means that engine parts stay cleaner. That lubrication points get all the oil they need. *Your engine runs more efficiently, parts last longer.*

4. What about oil consumption? Because AeroShell Oil W means decreased wear and a cleaner engine, you can expect less oil consumption.

5. Can AeroShell Oil W reduce my maintenance costs? If you have been using a straight mineral oil, AeroShell Oil W can reduce your maintenance costs substantially. Reason: your engine runs cleaner and cooler. Oil consumption is less. Thus, you can extend intervals between engine overhauls.

6. How does this new oil respond from a cold start? AeroShell Oil W has an unusually high viscosity index. This guards against excessive thickening of the oil when cold, yet provides outstanding lubrication when hot. Result: *easier starting, faster warm-up.*

7. Is AeroShell Oil W thoroughly proved? Thoroughly. It's had millions of engine hours of flight time.

8. Where is it available? At Shell Aviation Dealers everywhere. *Any* dealer will stock AeroShell Oil W if you ask for it.

9. Can I add AeroShell Oil W as a make-up oil? Yes. It is compatible with all piston engine oils now being used.

10. Is there more than one viscosity grade? What do I ask for? AeroShell Oil W is available in *three* viscosity grades: 80 grade for small engines where straight mineral oil grade 55, 65, or 80 is normally recommended. Also in 100 and 120 grades for large engines where straight mineral oil grade 100 or 120 is normally recommended.

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SHELL

A BULLETIN FROM SHELL
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Sperry

(Continued from page 41)

in 40 plants in 17 countries abroad.

In leadership of the joint corporation, one of the 50 largest in assets in all American industry, employing more than 100,000 personnel, General Douglas MacArthur was to serve as Chairman of the Board, Rand as Vice Chairman and Vickers as President and Chief Executive Officer.

Probably no three more remarkable men ever formed a trinity of industrial management. General MacArthur is without doubt one of the immortals of all military history. James Rand, in the tradition of Elmer Sperry not only founded and led a great corporation but authored a new industry—that of business machinery. Like Sperry he must stand as one of America's "most useful citizens." Of Harry Vickers, it has been said authoritatively that the United States Navy owes more to him than to any man in the history of seapower.

I might digress here a moment to observe that each of these three men has a particular place in the memory of old airmen, or at least of this old airman. General MacArthur was an intimate personal friend of "Billy" Mitchell. Compatible with his responsibility as Chief of Staff at the time of Bill's trial, MacArthur did all in his power to help "the rebel."

James Rand, through young Jim, took an avid interest in aviation during the critical years when it had no standing. Many a promotion project which needed a little financial backing knew where it could turn.

Harry Vickers of course is a top hand pilot, multi-engine rated and an avid "ham" radio operator. He talks airman's language without stumbling or fumbling in the cockpit or out. Vickers, we will recall, entered Sperry Corp. when the company he had founded, Vickers, Inc., (no connection with British Vickers) was purchased in 1937. His high performance pumps and hydraulic power steering gear for automotive vehicles were highly creative additions to industry. Sperry Corp., conscious that hydraulics was a basic force in control of power and motion (Sperry's area of enterprise), had already purchased a pioneer in hydraulics, the Waterbury Tool Company, which it later merged with Vickers. Originally President of the hydraulics Division of Sperry Corp., Harry Vickers became President of the parent company in 1952.

In noting that MacArthur, Rand and Vickers put together the Sperry Rand Corporation, we actually should list a roster; "right hands" . . . such men as Norman Frost, Kenneth Herman, Carl Holschuh, Carl Friesche, Charlie Green . . . but where does one stop? No man is an island unto himself and we just have to understand that the name of a leader implies the existence of a cadre around him.

Although Remington Rand had never been identified with the aircraft industry previous to joining with Sperry Corp., it now has a vicarious relationship, and airmen may be interested in the "whence" of this modern "in-law."

In a previous article, referring to the 19th century "era of invention," I mentioned the typewriter of a Milwaukee editor, printer and inventor, Christopher Scholes. Scholes

(Continued on page 60)

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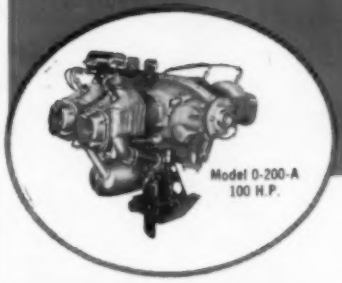
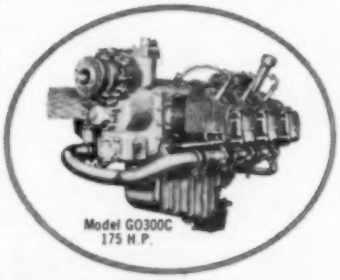
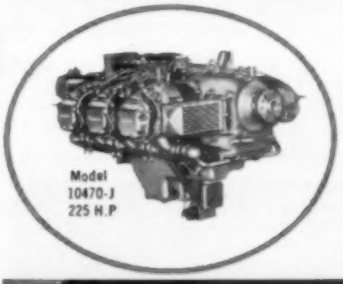


Model O-200-A
100 H.P.



Model GO300C
175 H.P.



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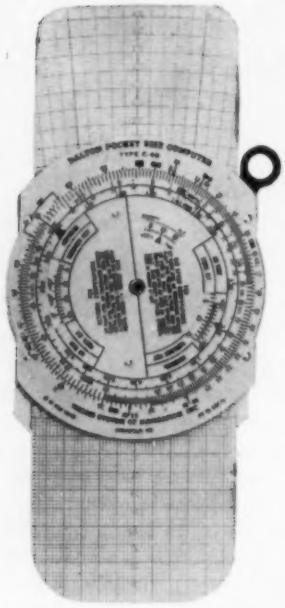

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Illustrated Brochure on request

(Continued from page 59)

took his invention to an upstate New York firm which manufactured sewing machines and farm equipment—E. Remington & Sons. (Another branch of the Remington family had founded the Remington Small Arms Co. but there was no business connection between the two firms.) In 1873, E. Remington & Sons produced the first commercial typewriter, whose historic impact was to introduce women into the manpower resources of the country and to start a revolution in business office procedures.

Several years later, a bank cashier in Tonawanda, N. Y., James H. Rand Sr., sat down and took a long look at the archaic condition of business office methods—filing, book-keeping, auditing, accounting, etc. He saw that this whole confused and confusing antiquity was a millstone around the national neck and decided to do something about it. His first move was to develop a visible index system and organize a company to sell the equipment—the Rand Ledger Co. By 1915 his son, James H., Jr. had invented another business aid which he called Kardex. By 1925, father and son had merged their outfits into the Rand Kardex Corporation.

Meantime, in 1913, E. Remington & Sons had become the Remington Typewriter Company, and in 1927 the Rands and Remingtons joined to form the Remington Rand Corporation. To this combination they added the Dalton Adding Machine Co., the Powers Accounting Machine Co., the Baker-Vawter Co. (originators of the loose-leaf ledger), and the Kalamazoo Loose-Leaf Binder Co. (How Remington Rand got into the electric shaver business is immaterial to us except to note that it became a prime item.)

In the more pertinent field of business machines development, Remington Rand, after WWII moved on into the field of automatic computers and in 1951 was in the market with Univac (Universal Automatic computer).

How this enterprise developed by research, acquisitions, and marketing is immaterial to our story—except that it did and Jim Rand was the genius behind the growth of Remington Rand's colossal stature when he and Harry Vickers consummated the joining of Sperry Corp. and Remington Rand into Sperry Rand Corporation, the vast industrial complex of which Sperry Gyroscope is an integral part.

As we observed several years ago when we began to develop this series of articles on Industrial Giants of the Air Age, we did not contemplate them as company histories but rather as portrait sketches which left some record of the origins, the trials and triumphs, the services and contributions, the personalities and products which had been pertinent to American airpower. Much has to be left out, much passed over hurriedly, many great names omitted. We cannot print a tenth of what we have written, or even a major fraction of what an old airman remembers about the corporate contributions which came to his mind in the form of planes and engines, instruments and aids of a vast variety. But if enough has been written to give the oncoming airman some idea of his aviation heritage through industry, then our purpose has been served. END

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Main Street Airlines

(Continued from page 35)

seats. Last, but not least, they want the government—through its agent, the CAB—to give them support in management's drive to keep operations and labor cost ratios in line for maximum public service benefits.

These important points were brought out during a series of conferences with carrier officials who are working under the cooperative banner of ALTA (Association of Local Transport Airlines). This organization is sparkplugged by local airline management—including Alaskan and Hawaiian members—and Joseph P. Adams (B/G, USMC, ret.), general counsel and secretary.

Local presidents agree that the number one lesson gained through the last two years of jet age experience is that it takes more than jet or turbine powered aircraft to achieve economic stability in air transportation.

Many members of the carrier's organization are jet age oriented and enthusiastic, but they've applied hard-headed realism to their thinking and planning. They want to go modern, but if they can't operate efficiently and economically with turbines, pistons must do until they can see more favorable economical results.

Two years ago, the prestige of an airline was measured by its having turbines or conventional planes. Today, that is not so.

One of the 20 local carriers, Pacific Airlines, now operating a mixed fleet of turbine and piston powered transports in high frequency commuter type service to 25 cities in California, Nevada and Oregon is considering selling its Fairchild F-27s. President Joe Connelly says this: "Pressurized Martin 404s produce about the same block-to-block time for our short segments. Now that the novelty of turbines has worn off we can do as well—or perhaps better—with piston engined transports for our very short, high density traffic runs."

Connelly believes the DC-6 aircraft, with high density seating capacity of 80 to 90 seats, and the relatively low purchase price in the $300,000 to $400,000 bracket, at this time may be better for Pacific passengers than turboprops. He did say that the British Aircraft Company's (BAC) 107, "Caravelle-type" pure jet transport may be used to advantage a few years hence.

Bonanza Airline operations in the same southwest and southern California region, where the average stage length is 201 miles and average system speed is 208 mph, to some extent counter Connelly's views about the turboprop F-27. Bonanza's fleet of 10 Fairchild transports has been instrumental in raising Bonanza's passenger traffic 36 per cent beyond 1958.

Bonanza has established excellent operations records with the Fairchild F-27 over its route structure. Its operating costs have been consistently lower than the DC-3 and other F-27 operators.

The shutdown of Fairchild's F-27 production line, and the resultant fear of low resale price of the airplane, may have exerted strong influence upon the thinking or attitudes of airline people who heretofore have placed high stock in the F-27 turboprop. This situation has been reflected in

(Continued on page 64)

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(Continued from page 62)

cases other than Pacific Airlines. It is reported that Quebecair, a Canadian carrier, has offered its F-27s for sale and is now operating Canadair Eland powered 540s.

Time has done well by the Convair, either the conventional piston powered model 440 or the converted turboprop version with Eland or Allison turboprop power. Its versatility and utility over a wide mixture of route structures has placed it in a strategic position ahead of new twin-engined turbo aircraft.

Despite the lure of shiny new planes, many locals have decided to wait before buying them. Gwin Hicks, president, Lake Central Airlines, says that his high density market makes it advisable for the management to take a long look at the new turbine powered helicopters now entering the transport scene before equipping its fleet for long range growth. Lake Central's routes entwined about cloistered cities—20 of which are over 100,000 pop.—offer a natural base for helicopter inter-urban operations.

Significantly, Lake Central, Allegheny, Piedmont and a host of other applicants are pressing hard for helicopter airlift rights between Washington's National and new Dulles Airports and Friendship International Jet Terminal at Baltimore, Md. It appears that this triangle airlift contest will help set the stage for similar local airline operations – city-center to city-center – in other parts of the country.

Lake Central has several potential short haul city-center to city-center combinations within its route area. It is understood that the predicted 200-knot cruise speed of Vertol's 107, 25-passenger, twin-rotor transport helicopter has developed the company's appetite for closer study of its use on very short high density commuter route segments.

Following the predicted appearance of mixed rotor and fixed wing fleets in local airlines planning schedules, the spotlight of decision has been focused upon CAB to rescind the one-stop and skip-stop requirements for locals between regional traffic centers 200 to 300 miles apart.

As it stands now, the local carrier—such as Bonanza Airlines, operating between Phoenix and Los Angeles—cannot make non-stop flights between regional terminals regardless of how much traffic demands it. Opposition claims such service "violates" trunk line franchise and establishes "a competitive climate unfavorable to the trunk."

ANOTHER good example of why it takes more than jets to obtain air transportation progress is the question of subsidy or "public service payments." The latter term is preferred over the former which implies "government handouts."

It has been customary for the government to support airline service to communities which do not generate sufficient revenue to pay their own way. CAB makes up the difference through government support payments to the carrier. Within 10 years such payments have been reduced from approximately $17 to about $6 per passenger.

Local public service revenue payments range from 18 per cent to 43 per cent of total annual income of individual companies.

CAB members now have approved a plan, made retroactive to January 1st, 1961, which provides the basis for CAB and airline management to agree upon its public service support operations before the costs are incurred. It also incorporates proper incentive to management to strive for efficient operations that will produce earned income without strings attached.

This spells confidence and rising recognition for the local carriers in the development of air transportation. It denotes maturity and rising financial stability for a family of carriers who, until two years ago, have been looked upon as potato patch airlines since their beginning more than 12 years ago.

Now that locals have carved a niche under the high-flying umbrella of long haul trunk line jets, maturity and growing stature have produced their fair share of complex issues. Some of the most urgent items requiring attention are:

- Demonstration of responsibility by pilots and aircrew unions through realistic wage and fringe demands so as not to hike subsidy payments far beyond the government's range for fair return.
- Present financial retrenchment may provoke closely controlled carriers into seeking merger deals that will be detrimental to the regional carriers' growth (Capitol and United merger is believed by some to be the start of a trend in this direction).
- Clear definition of trunk and local areas of influence and operation must come from the new CAB. Clarification now can prevent serious conflict of interests further down the pike.

(Continued on page 66)

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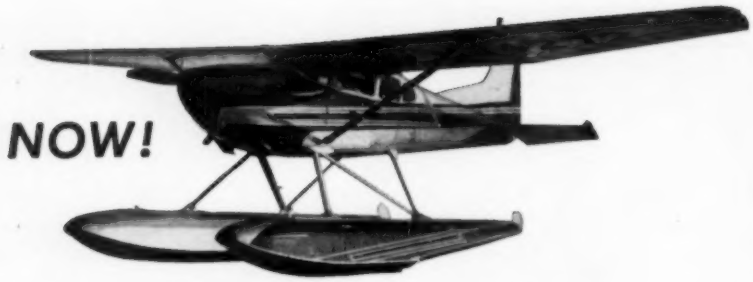

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(Continued from page 64)

• Locals vote unanimously to oppose creation of single transportation czar. They believe the specialized nature of air transport operations requires administrative control from an agency fully trained and familiar with carrier problems. Coordination of transportation effort can be achieved by current voluntary, cooperative system.

• Locals need relief from "around the mulberry bush" airways flight requirements. Delays due to circuitous airways routing have in many instances negated much of time savings by air. On some very short segments, where airways routes are complex and indirect passengers can beat air time by auto—their only incentive to fly is to gain convenience in making long haul air connections. In this department alone, local carriers feel they need and deserve special study and attention.

Leslie Barnes, president of Allegheny Airlines, outlines the '61 and '62 mission in one short phrase: "We must have the courage of our convictions and the drive to work them out together."

After 17 months of testing, the pioneer commuter route between Pittsburgh and Philadelphia has on-the-hour departure between the hours of 8 a.m. and 9 p.m. Nineteen of the flights are Canadair turboprop equipment—one is a Martin 440. Passengers buy tickets at the airport, take their chances on reservations and save up to 40 per cent of the fare in the process. Since March 1st, load factors have hit 60 per cent.

Barnes plans to start similar frequency service between Washington and New York if CAB sanctions his bid. Although trunkline operators are opposing the move, he believes Allegheny's commuter flights will develop new business for the trunks, too.

Although the $1 service charge imposed by some of the trunks helps improve the profit picture for the long haul airlines, that $1 can become an important item of sales resistance against local travel—It can oft-times make the difference between a prospect driving or flying to his destination on the local route.

An historic action in local or regional airline operations took place in February when Robert Peach and Malcolm A. MacIntyre, presidents of Mohawk Airlines and Eastern Airlines, respectively, jointly petitioned the CAB to approve the transfer of eight EAL local stop-cities to Mohawk's 45-city network—two are in Vermont and six are located in upstate New York.

The step is significant in that it blossomed and developed through the voluntary effort of the carriers—the CAB serving finally and only as the evaluation agency. Heretofore, the general practice has been for CAB to take the initiative to order such action.

The CAB by its decision in this instance will set the precedent for similar exchanges of route stops between trunks and regionals throughout the country.

As FLYING's Position Report on local carrier airlines is closed, the Mohawk-Eastern move is a welcomed sign towards future developments. It demonstrates the importance of honest, realistic and voluntary effort among the carriers to work out their own problems—and hints of a healthy trend.

The nation's air transport system, its stability and financial strength, truly depends upon more than jets. END

Should You Use Detergent Oil?

Ever since the introduction of aviation detergent oil some twelve years ago, questions have come up regarding its use and benefits. The Gulf Oil Corporation, which produces and sells both detergent and non-detergent aviation oil, hopes that the information below will help you decide whether you should use a detergent oil.

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This detergent oil, sold under the brand name of Gulfpride Aviation Series D meets—in fact, *exceeds*—the performance specifications for both Continental and Lycoming engines, and is suitable for *all* types of aircraft piston engines under *all* operating conditions.

ARE ALL DETERGENT OILS ALIKE? No. Different brands are made from different base oils and contain different amounts and types of detergents. Furthermore, some brands are multi-viscosity and others are single-viscosity.

Gulf believes that the detergent used in Gulfpride Aviation Series D is superior in keeping engine high-temperature zones, such as valve stems, rocker boxes and piston ring areas, clean. In other words, Gulf's detergent dispersant works best where it's needed most. Gulf and the engine manufacturers recommend *single*-viscosity oils for aircraft engines.

WHEN SHOULD A DETERGENT OIL BE USED? The best time to start using Gulfpride Aviation Series D is when your engine is new or freshly majored. Twelve years experience, however, has proved that you can benefit by using Gulfpride Aviation Series D regardless of time on your engine. Change oil *faithfully* as recommended by the engine manufacturer. This simple procedure will pay off in better engine performance and *more hours between engine overhauls.*

ANY OTHER QUESTIONS? Gulf has additional information available in a Gulf product review on both Gulfpride Aviation Series D and Gulf Aircraft Engine Oil. Write to Aviation Department, Gulf Oil Corporation, Pittsburgh 30, Penna.

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T-38 Talon

(Continued from page 31)

test pilot Jack Wells rode the front cockpit of the T-38 during the flight; however, this check pilot did most of the flying from the rear seat.

In the cockpit check prior to engine start there are no unusual items to be accomplished. Each engine is supplied from its own fuel tank, and three switches are used for fuel management—left and right booster pumps and crossfeed.

The engines on the T-38 can be started with low pressure ground-supplied air to both engines or to the right engine only. For the evaluation flight, ground air was used to start both engines.

Both cockpits of the T-38 have engine start switches which have positions for *air* or *ground* start. Starting is accomplished by putting the switch into the *ground* position at six per cent rpm when air is turned on, throttles are moved to *idle* position at 10 per cent rpm while fuel flow, exhaust gas temperature (EGT) and oil pressure rise are monitored.

After engine start, normal procedure calls for a flight control system check and setting the flaps 25 per cent down for takeoff. The takeoff trim switch positions elevators properly for takeoff, and a light indicates proper trim. The T-38 incorporates dampers in yaw and pitch axes, and if systems are to be used, switches are activated during initial pre-start cockpit procedures.

One of the most prominent features of the Talon is rear seat visibility. Elevated 10 inches above the front seat, the rear seat affords more than adequate visibility for taxiing without undue strain on either front or rear seat occupant—there is no necessity to lift and crane from the back or scrunch down and sideways in the front.

AIR Force Jet 59603 weighed approximately 11,615 pounds on the ramp, and taxi and runup time were short, minimizing fuel burnout prior to takeoff. Temperature was below standard both on the ground and at altitude the day of the flight.

Receiving takeoff clearance, the airplane was taxied into position, engines checked with a throttle burst while holding brakes and monitoring gages, then brakes were released and afterburners lit. Since the thrust-to-weight ratio of the T-38 approaches one-to-one, the airplane cannot be held against the burners with brakes alone.

When our burners lighted for takeoff, the aircraft accelerated swiftly. As a matter of fact, for those used to flying jets which have the normal, slower rate of acceleration, the Talon's acceleration similarity to a scalded cat could be disconcerting.

During takeoff roll, nosewheel steering is disengaged at 60 knots IAS when rudder becomes effective. Technique calls for rotation at 140 knots IAS, followed by gear and flap retraction as soon as possible, since the airplane becomes airborne at completion of rotation. For this takeoff, roll distance was approximately 2,000 feet from brake release to liftoff.

The T-38 is a very responsive airplane, but not oversensitive.

After cleanup, the aircraft is accelerated straightaway to Mach 0.9 for afterburner climbs, (350 knots IAS for military power). The 0.9 Mach number is held to 30,000 feet where it is increased to 0.93 Mach.

The Talon requires a definite noseup attitude to hold climb schedule, approximately 25 degrees for an afterburner climb on Mach schedule up to about 35,000 feet, decreasing to the order of 18-20 degrees from there upward.

Our climbout, from brake release to 32,500 feet, took two and a half minutes. This was the first such climbout of a completely production aircraft.

AT 43,500 feet the nose was pulled up abruptly. At this point, the left afterburner blew out and the engine flamed out.

A check later in the flight showed a malfunction in the static side of the airspeed system which had not shown up on the preceding production test flight, the first.

Calculation subsequent to the flight established that at the altitude and indicated airspeed at which the burner blew out, our actual Mach was outside the operating limits envelope for the engine. It was excellent testimony to the airframe-engine combination that the right burner and engine stayed lighted through the pull-up.

To restart the left engine, the aircraft was nosed back down to 30,000 feet at 250 knots IAS. The engine started with no trouble, and both engines were checked for operation with and without afterburner.

At 30,000 feet we made some level turns with high induced acceleration—up to 3Gs, to sample the aircraft's accelerated stall warning, which proved to be a mild airframe buffet. Control pressure was eased and the stall broken after initial clear buffet was felt. After the stalls, we discovered that a slow roll is a natural and easy maneuver for the Talon. Minimum rudder was required to maintain directional control; general responsiveness was excellent.

During a run in the Air Force Flight Test Center's supersonic corridor, the T-38 reached 1.25 Mach using afterburners, exceeding the guaranteed Mach 1.24.

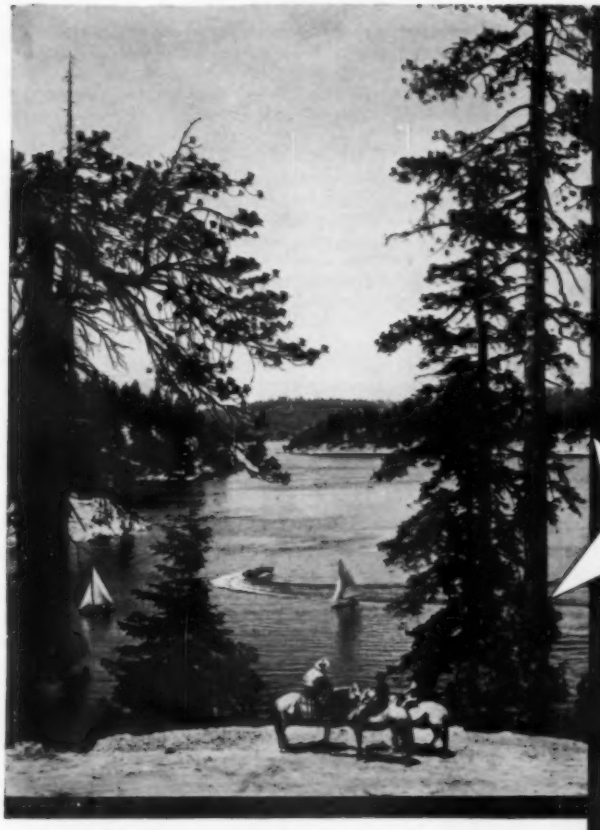
In the AFFTC dive area after the supersonic run, the T-38 was dived at reasonably steep angle for a short time, with dive terminated by a normal pullout and extension of speed brakes. The Talon underwent no significant trim change during speed brake extension or while flying with brake extended.

The two-axis stability augmentation system of the T-38 had been turned off about one-third of the way through the flight and was not used again. It was this pilot's feeling that the system was not an absolute necessity, even at supersonic speeds.

Following completion of the dive test, Wells flew the Talon through the front half of a cuban eight, holding a constant four-G pullup. The aircraft flew through smoothly, without apparent longitudinal trim change.

Flying the initial ILS checkout brought the T-38 to a position at the inner marker which was considerably higher than normal. We chose to land the plane from the bad initial position, since it was one which could well arise with student pilots in basic training. Holding recommended final approach speed of 150 knots with full flaps and gear extended, the T-38 proved no problem to land.

(Continued on page 70)



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(Continued from page 68)

After touchdown, the flaps were set to *takeoff* and burners lighted for a maximum performance takeoff. The aircraft was airborne again approximately 200 feet from the point where burners were lighted, accelerating very quickly with its lower gross weight. Burners were not left on very long, less than 30 seconds, to avoid exceeding the 240-knot gear speed.

A normal pattern and approach was flown on the second landing. Here the T-38 showed very good handling qualities and control responses through final, flare and touchdown.

For this touch-and-go, military power alone was used. The airplane was airborne again in less than 1,000 feet after the power was advanced.

On the final landing, Wells demonstrated the Talon's short-field capability. He held the nose well up after main gear touchdown to most effectively reduce speed till the wheel brakes became effective. The landing roll was respectably short.

The excellent visibility during the landings and the airplane's handling qualities and flight characteristics in the pattern combined to produce a very favorable impression of this airplane as a trainer.

Since the T-38 has two engines, some training can be given in procedures for one-engine-out flight with multijet aircraft. However, this pilot noted that yaw was negligible when the left burner blew out, even at the high altitude, low actual airspeed and nose high attitude.

The first USAF class to use the T-38 will begin next September. It will come from primary training in the T-37, also a twin-engine jet trainer.

Syllabus for this first all-jet class for some 132 hours in the T-37, then approximately 130 hours in the T-38.

The T-38 will be assigned to five bases, all of which also will be primary schools with T-37s, the arrangements to have the primary school on one side of the field, the basic, T-38 school on the other.

WHEN it closes its contract flying schools, USAF will have its own flight training in multijet equipment of two types only, from first flight to graduated pilots.

Currently, USAF has funded construction of 213 T-38s. This number, at current delivery rates, will insure active Talon production through calendar 1962. However, it has been reported that total USAF T-38 production may run as high as 750 airplanes. Should the airplane be sold to any other customer, additional production might be programmed, or the production rate increased to permit simultaneous deliveries to USAF and other customers.

Although Northrop considers USAF its prime customer for the T-38, it has been learned that interest in the airplane has been shown by other potential customers.

Among these is the U. S. Navy, and although that service has not programmed any funds for procurement of a T-38 type airplane, Navy people have been seriously evaluating the Talon.

Another area of possible sale which has not been neglected is the West German Air Force, which currently uses the T-33 as a basic trainer. Originally, Northrop Corp. sales effort in Germany and other parts of Europe was directed toward sale of the N-156F, the fighter which is based on the T-38 design.

Design of the T-38 is complementary to the low-cost philosophy. It has been designed for very quick turnaround times and minimum maintenance per flight hour.

Exemplifying this approach is Talon's systems design, which has the engine-driven accessories mounted on the airframe rather than the engine, enabling each to be worked on or replaced without having to remove the other. Each engine drives its own two-speed, automatic shirting gearbox, and each gearbox drives an afternating current generator and hydraulic pump. Each engine is capable of meeting flight requirements for prime propulsion and safety of flight systems by itself; even windmilling engines after a double flameout provide sufficient hydraulic power to operate the flight controls.

Special handling equipment for the T-38 also takes advantage of low-cost approach. All units are aimed at one-man handling.

Another area where Northrop sees significant economic advantages is in fuel cost. The T-38's two J85 engines are a far cry in fuel consumption from the large powerplants with afterburners which power the majority of operational aircraft.

The combination of a small, lightweight, twin-engine trainer with performance to spare and economic advantages will give the T-38 a long and useful career. END

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March, 1917 . . . René Fonck in a Caudron G. IV bomber engages Albatros single-seaters.

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This French, twin-engine two-seater was used for bombing and reconnaissance in World War I during 1916 and part of 1917. When powered with 80-horsepower rotary engines, the G. IV had a top speed of about 80 m.p.h., an initial rate of climb of 380 feet per minute, and a maximum endurance of 4 hours. It was normally armed with a single machine gun, mounted ahead of the front cockpit and fired by the observer. Featuring warp-control wings instead of ailerons, slow and awkward, the G. IV seemed scarcely adequate for operational flying. It was enough of a plane, however, to start the French Ace, René Fonck, on his amazing combat career.

The opportunity occurred on March 17, 1917, after Fonck had spent two years as a bomber-reconnaissance pilot. Ever since his Caudron had been armed with a machine gun some nine months before, Fonck set himself to the task of downing an enemy plane. Although he had been involved in some indecisive engagements and achieved one victory of sorts when a two-seater surrendered, uncompromised success still eluded him. On this day, Fonck was not to be denied. He was flying with another G. IV when five Albatros single-seaters attacked. In spite of the odds, Fonck and the other G. IV pilot accepted combat. In the ensuing struggle, Fonck skillfully managed to evade the attackers . . . maneuvering his ungainly craft for a telling shot. His observer fired, and an Albatros went down. The other Caudron was disabled and crash landed inside French lines.

Shortly after, Fonck was transferred to a "fighter" group, the famous "Cigognes" or "Storks", where he was soon noted for his expert marksmanship and skillful combat tactics. At the War's end, he had 75 accredited victories and was the leading Allied ace . . . twice credited with shooting down six enemy planes in one day.

PHILLIPS 66

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Twin-Engine IFR

(Continued from page 45)

passengers and yourself. Doing this prior to entry will assure safety and allow you to devote your full attention to the control of the aircraft under these trying conditions.

Generally, heavy precipitation and turbulence occur simultaneously. Often extreme vertical currents are encountered and it is advisable to drop the gear and reduce power in order that a safe airspeed and good control can be maintained. This would be particularly true when extreme upward vertical currents are encountered. Even with higher rpm and manifold pressure, the cylinder head and exhaust temperatures often will fall too low to insure ample carburetor heat and safe engine operation. This is another good reason for dropping the gear. Doing so allows you to increase manifold pressure and still maintain a low airspeed to insure good temperature control.

All of this pre-planning will now enable you to maintain the proper division of attention necessary to proficiently control the aircraft under instrument conditions and keep a close check on engine instruments, figure ETAs and make the necessary position reports to the air traffic control centers.

I recently had a night trip from Philadelphia, Indianapolis, Albany and return to Philadelphia. Ninety per cent of this flight was on solid instruments.

A pre-check of the weather showed a heavy squall line extending from a strong low pressure system over east central Canada to the Gulf of Mexico.

Because of the duration of the flight (10 hours), and the extreme weather, I decided to take a copilot along.

I picked 8,000 feet for the leg from Philadelphia to Indianapolis, because of winds and freezing level. The freezing level in the Philadelphia area was 12 to 14,000 feet and slopped down to about 9,000 feet in the Indianapolis area. We had just left Philadelphia departure control and been turned over to New York Center when we entered the overcast at 4,000 feet over Pottstown omni.

From that point until we broke out on the ILS at Indianapolis, we were on solid instruments. At the time we checked over Appleton omni east of Dayton, Indiana, Center changed our routing to north of Dayton. At this position we were just beginning to experience moderate to heavy precipitation and turbulence. I reduced airspeed in the following manner:

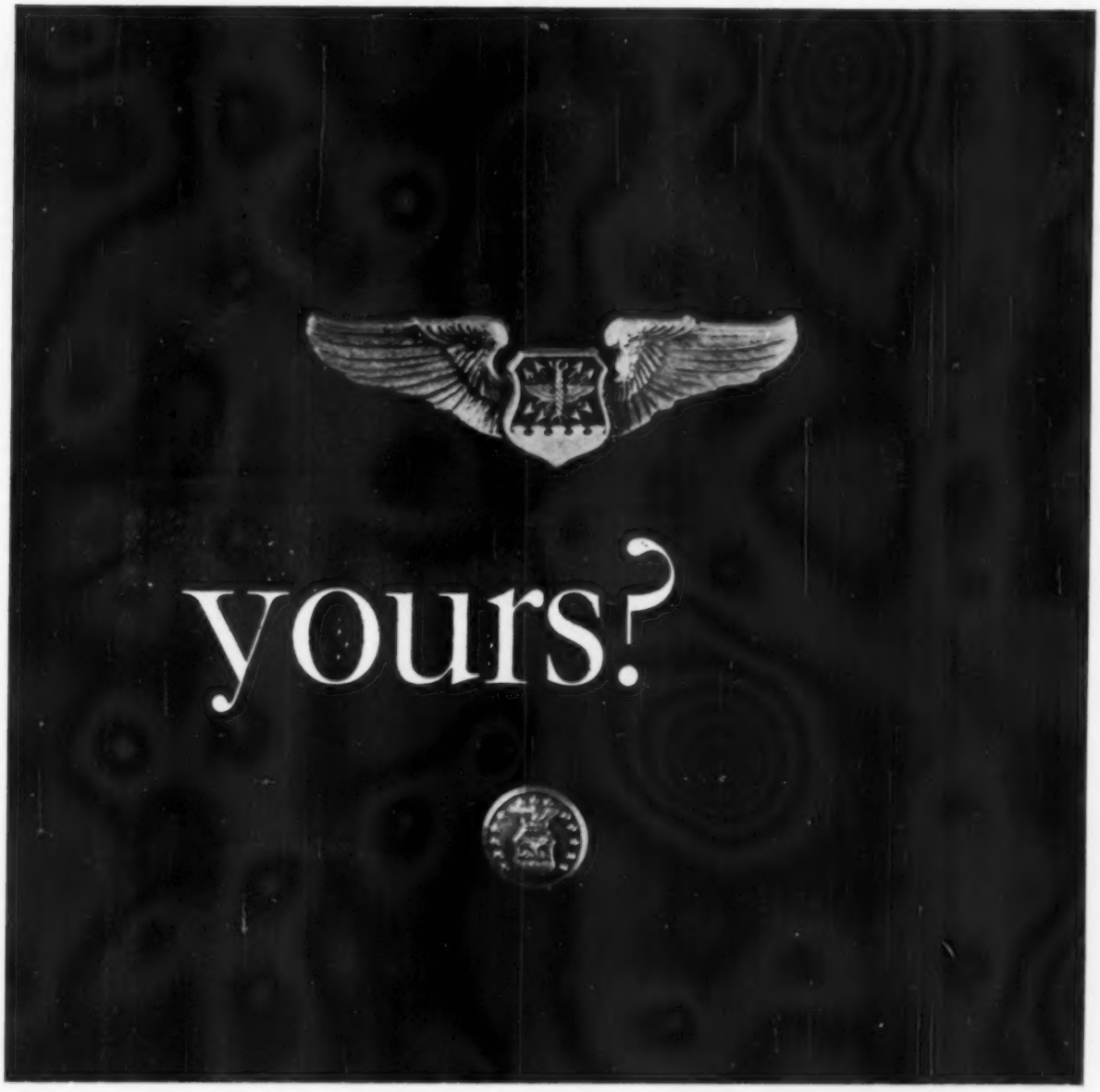
Manifold pressure from 21.5 to 19.5 inches and increased rpm from 2,600 normal to 2,700; this being done to keep cylinder head temp up to safe range.

From Indianapolis Center, I requested information pertaining to the position of the most intense activity, as shown on their en route radar. They advised that a line about 25 miles wide extended through the Dayton area. They also advised there were areas in the line showing less intensity.

I first asked for radar steers through the soft spots in the line. I also asked to be advised about five miles before entry as seen by the center's radar. Indianapolis Center was more than glad to help.

We passed through the 25 miles of ex-

(Continued on page 74)



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(Continued from page 72)

treme precipitation and turbulence with nothing more than a little discomfort. On the other side we broke out on top of a solid overcast and shortly made an ILS into Indianapolis.

Our return trip via Albany was very much the same, with the exception that the front had moved further east. Weather checks indicated the front now to be a line through Cleveland and Pittsburgh. Weather also advised that the squall was less intense the closer we got to the low pressure system, so we chose to take the northernmost route through the Erie-Bradford area.

There were two changes in flight conditions on the return trip; ice and St. Elmo's fire. We were assigned our requested altitude of 9,000 feet for the return. Because of the more northern route and the normal lowering of the freezing level at night, we encountered light rime ice. We also encountered fairly extreme St. Elmo's fire. St. Elmo's fire can have an adverse effect on both the magnetic compass and radio gear. It will particularly affect low frequency reception, including your ADF, and you will have to rely on the VHF in extreme cases. Our magnetic compass was off as much as 50 degrees, but the remote fluxgate compass was not affected. This type of compass is rounded and virtually unaffected. If you are going to do much weather flying, you should have one.

Let's now take a look at what type of instrumentation and equipment is required today. I will first list what I feel would represent the minimum requirement for a light twin today:

Altimeter, airspeed indicator, pitot heater, magnetic compass, turn and bank indicator, engine vacuum gage, rate of climb, directional gyro, artificial horizon, outside air temperature gage, complete communications (90 channel minimum).

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As your proficiency improves, you can add equipment to the aircraft to meet the new types of weather conditions you expect to encounter.

You might get the impression that multi-engine aircraft are a must for IFR flight. This is not necessarily so. True, single engine instrument flying must have some well founded restrictions, but it is still feasible. I have flown many hours of single engine instruments in Bonanzas that I have owned in the past, however, I always imposed limitations on myself:

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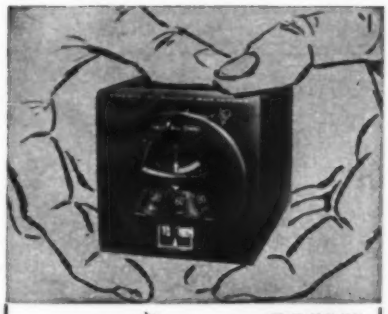
I hope that some of my experience over the past 20 years will help some newcomers to instrument flying as well as some of the old timers. All of us who are honest with ourselves will admit that on each flight, and every day we learn more. END



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I Learned About Flying

(Continued from page 50)

his mouth he yelled: "You're doing great." I shrugged my shoulders and brought the plane onto the downwind leg, got it lined up parallel to the runway and again raised my arms and looked back. Again he waved me to keep flying the plane. I carried on until I reached the point to turn on base leg, and then I throttled back and, turning in my seat, hollered as loud as I could:

"YOU TAKE IT."

He pushed the throttle forward with one hand and with the other waved to me and cried: "Go ahead and land it, you're doing fine."

I made the turn onto final approach and again turned back to him and called:

"I *can't* land it. I'm blind on the ground. IT'S ALL YOURS."

I could see him straining to hear my message, but apparently he failed to receive it through his thick sheepskin-lined helmet and the rush of air whistling through the wires. At this point, neither of us seemed to be flying that aircraft, so I kept on flying and yelling to him, but he never did hear me. Obviously he had forgotten that as soon as the tail came down after landing I would be strictly on instruments.

The last glimpse I had of the ground, as I began to flare out for the touchdown, was the high walls of snow on either side of the runway—and the beginnings of numerous little drifts which were by then beginning to encroach upon the concrete in little swirls and lumps near the edges. After that I kept looking straight ahead, keeping the ship lined up straight as I made a wheel landing with plenty of runway to spare ahead. I kept the tail high as long as I could, putting off the evil moment when it would settle down and I would be able to see absolutely nothing.

AND then down it came, settling on the runway with a nice little smack; and I sat there, utterly blind and still rolling fast. Trying to summon up all my intuition I strained to remember what "straight ahead" felt like, and manipulated the rudders accordingly. Just as I was beginning to think we had made it o.k., however, I suddenly felt the plane give a mighty swerve. One wheel had caught in one of the little encroaching drifts, and in an instant the plane had whipped around in a tight swish that felt like one of those "whiplash" rides at amusement parks—and then ZINGO, up went the tail and down went the nose and suddenly all I could see was swirling snow in front of my horrified eyes. For a split second we were balanced straight up on the prop, and then WHAM, over she went, upside down in the snow bank.

The plane settled down with a sort of gurgling sound into the deep snow and in the abrupt silence that followed I began to hear the drip-drip-drip of gasoline starting to run out of the upside-down tanks. I reached up (since the floor was over my head, naturally) and turned the gasoline shut-off valve. Then I pulled the catch of the safety belt and went kerwham on my face in the snow. Crawling out from under the plane I saw Bill doing likewise from the rear cockpit. We just stood there for a few seconds and gazed thoughtfully at each

(Continued on page 76)

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(Continued from page 75)

other. When I figured I could trust my voice I asked him if he had forgotten that I would be blind as soon as the tail came down.

"Oh my Lord—I did forget," was all he could reply.

We turned to gaze mournfully at the upside-down Boeing and then at the taxi strips along which several cars were whizzing to our rescue.

In due time the plane was towed majestically into the hangar—its tail askew and its wings looking extremely sad. Bill, by this time, was rushing about purposefully, supervising and examining, whistling away as though he had not a care in this world. Finally he returned to the office.

"Well, she's all set," he said. "Probably one broken spar; perhaps two. Tail shot to pieces. Prop. Not too bad, all things considered."

"Listen," I said, "Please come in here and sit down. We have to talk. I feel terrible about this, and morally responsible for most of what happened. Now," I said, settling down in a chair and preparing for a long, legal chat, "I have $700 in a bank. It isn't much, but it's a start. I also have a steady job. This is going to be very expensive and I want to. . . ."

HE waved me off.

"Forget it," said Bill. "It was all my own fault. You told me at least four times to take over and land, and I just plain forgot that you had a reason." He smiled disarmingly. "All my fault. Sorry it happened. Don't worry about a thing. Thanks though."

Bill insisted he could handle it through his insurance carrier. "But maybe under the circumstances they can't pay this claim," I protested.

"The agent is right here on the field," replied Bill. "I've been talking to him in the hangar—and incidentally he has to talk to you, too, before you go. It'll be okay. You're not liable for anything."

I finally extracted a promise from this extraordinary young man that he would contact me if there was any hitch in negotiations on the insurance claim. I obtained the same promise from the insurance agent when I talked with him at some length later on, and I left my address with both men.

I wasn't trying to be "noble" or a martyr—I just knew I would have to spend my life living with myself and couldn't do this with any real enthusiasm if I failed to admit responsibility in a very sorry mess partly of my own making.

From that day to this I have never heard another word from either of them.

As I finally flew away in my PT-26 toward Canada, that fine, cold wintry day, a sadder and a wiser girl, I looked back at that airport and knew I had been lucky far beyond my desserts. I thought of Bill, whose name wasn't really Bill, of course, and I vowed that the next time a good-looking young man invited me to come ride with him in his flying machine I would think once, twice and thrice—and then ask for all his credentials before making a decision! For had it not been for the kindness of that particular man, plus the fact that he had such a nice insurance company, I might have found myself in a legal and financial mess to regret bitterly for many years to come. END

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Illusions

(Continued from page 39)

5,000 feet, the pilot may find that his straight-in approach was poorly judged and that his flare-out was too high. Once or twice around the field before entering the pattern would have improved his judgment of depth.

The distance from other objects similarly may be repeatedly misjudged against any uniform background—thick haze, twilight illumination, the dark of night, flying over smooth water. In such circumstances, the wingman may be constantly changing his estimate of distance from the lead aircraft; or the latter may seem constantly to shift nearer and farther away. At times, nearby aircraft or other objects may suddenly appear to decrease in size and again abruptly to assume their former dimensions.

Under conditions of uniform darkness at night, the brain has great difficulty in making accurate judgments about the nature of lights and their movements. The commonest errors involve mistaking the meaning of lights, because of their isolation, or because lighted objects at night seem to differ from their customary daytime appearance.

Ground lights may be mistaken for stars and vice versa. The pilot may find himself following a star, thinking it is the light of another aircraft; lights on the ground may be mistaken for those of an aircraft or the lights of two planes far apart may be interpreted as one plane close by. At night when the horizon may be defined by a row of lights, the plane of the horizon may be misinterpreted if a line of lights actually follows a curve along a bay or if they are viewed from an angle.

Even flashing or colored lights can cause difficulty. A pilot at night mistook a red and a green light on a bridge 1,500 feet below him for the navigation lights of a nearby aircraft, pushed over to avoid collision, realized his mistake too late to recover completely from the dive but was lucky enough to hit the ground in a level attitude and slid to a safe stop.

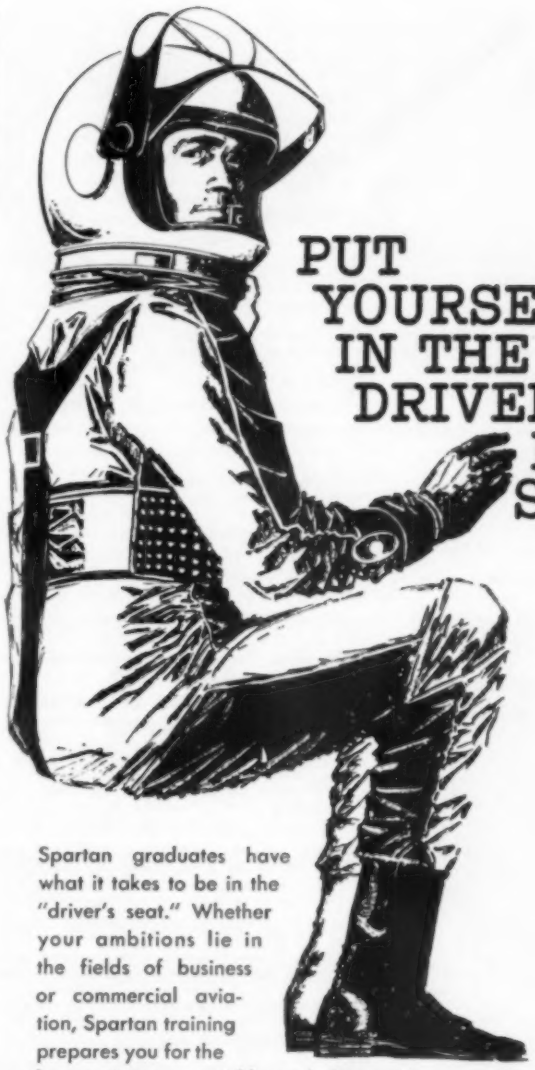
Lighted oil wells, broadcasting towers, automobile headlights and tail lights, and lighted buoys have caused similar confusion. At times, the pilot may have the sensation that the lights on the ground or the stars are moving, and that he is motionless.

Such illusions are aggravated and multiplied when the pilot and the light he is watching are both in motion. Another aircraft which is going away may seem to be approaching and vice versa. Lights on two aircraft which are separating may appear to a third pilot like one aircraft approaching him. In flying behind two planes going away from him and separating, a pilot may think he is seeing the lights of houses approaching him.

Part of the pilot's own movement may be wrongly attributed to another moving lighted object or aircraft, or the movement of other objects assumed to be his own. If the pilot's direction or speed of movement or angle of pitch or angle of bank changes without his awareness, the apparent movement of outside lights can cause the pilot to misjudge their true speed and distance.

In formation at night, a leader may think he is turning when he and the wingman are

(Continued on page 78)



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(Continued from page 76)

only moving at different rates of speed. A helicopter pilot may be thoroughly confused by the reflection of ground lights creeping up and over his canopy as his aircraft passes over them, with resulting erratic maneuvers.

Another kind of illusion involves a sense of reversal of figure and background. For example, momentarily the indicator on an instrument may appear to be stationary and the dial to move; the pilot may interpret this to mean that the instrument is moving rather than his aircraft.

True pilot's vertigo can create or worsen visual illusions. Vertigo resulting from rapid rotation of the body may be so severe as to cause quick jerky side-to-side movements of the eyes; the surroundings then appear to revolve in a direction opposite to the body's former rotation. In this condition, the pilot may not be able to read his instruments because they seem to be constantly moving. The pilot should be aware however that actually very little rotational movement of the body is needed to produce the same result on a very dark night.

Another kind of illusion is most easily demonstrated on the human centrifuge, though liable to occur during high-speed rolls, spins, and steeply banked tight turns. Here, objects inside the aircraft and the outside surroundings appear to shift out of position and even to rotate about a central point. In spite of prior knowledge about this condition, the pilot may not be able to correct the wrong impression until the G force becomes constant or when the aircraft assumes a normal attitude.

At times bizarre illusions difficult to explain may occur. The pilot sees clearly below him terrain with which he is thoroughly familiar; yet he may fail completely to recognize it and even be temporarily convinced that he has never flown over the area before. Or a completely strange landscape may suddenly seem not only familiar but be identified incorrectly as a completely different location. Another kind of curious illusion involved a naval pilot over the Atlantic, headed toward Jacksonville, Fla. While staring at the Florida coastline he had the sudden impression that the whole coastline revolved 45 degrees, although the aircraft continued to fly straight and level. The illusion corrected itself, though the pilot was badly shaken.

With these illusions of sight, perhaps the most effective means of combatting them is the knowledge of their existence and of the circumstances likely to produce them. END

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To Buy or Not

(Continued from page 27)

chances, through $500 a year if you want to cover student pilots flying your airplane solo. A median is to have public liability ($50 a year for $50,000 coverage) and hull insurance (which can run up to eight per cent of the insured value of the aircraft, or about $180 annually for our airplane). Let's say we spend in all $240 annually for insurance, or $20 a month. Add these costs, and we have $45 per month overhead to own our airplane. If we do keep the plane in good condition, and plan eventually to sell it for as much as we paid for it, we can stop right here and say that the airplane will cost us $45 per month plus $2.80 per hour for fuel and oil.

If we want to keep the airplane indefinitely, though, we might figure for the cost of the aircraft itself, at an arbitrary $65 per month, whether we actually pay that amount as we finance the airplane, or just want to consider it in the total cost of ownership.

A graph of total cost per hour against flight hours per month for our typical two-place lightplane would show just how many hours we must fly to make the airplane more economical to own than it would be to rent. Every item that we have dealt with, however; maintenance, tiedown fees, insurance, and financing cost; is a variable, even fuel and oil consumption will vary, though not so widely.

There are your own intangibles to figure into the cost of the airplane, too. How much time and fuel you use driving to and from the airport, the hours you spend washing and polishing and improving the airplane, the satisfaction you feel when you fly it, the outlook-broadening that comes of seeing different people and different parts of the country, and, in business aircraft, the advantage of putting the company man quickly where he is most needed.

A four-place lightplane would show the same curve on the graph, but at a more expensive level. There are a few four-place airplanes that make an exception to this rule of greater expense, and cost as little to own and operate as our typical two-place. The 1947 Stinson Voyager, for instance, can be found for sale in that same $2,300 range; a 1948 Cessna 170 can be had for approximately $3,000, as can 1950-53 Piper Pacer and the 1951-52 Tri-Pacer.

Let's say that you add the figures together and come out with one figure, double-underlined, that says it is not only possible, but economical for you to be the master of your own airplane. At this moment, it is well to find some good stout ropes and have a friend tie you firmly to your armchair, for it is not yet the time to walk out into the sunshine and begin looking for your airplane. It is time to decide just what you want when you begin looking.

The final decision, again, rests on a host of variables and individual tastes, and on the use to which you are going to put your airplane. The area where you live is one consideration, and an important one. If you live away from the cities and high-density areas, and use your airplane only for day VFR flying, you certainly don't need the extra equipment that the fellow needs who flies daily in the haze over Los Angeles or through the super-dense airspace about New York City. In those locations, it is advisable, and sometimes required, to have at least a two-way radio on board your airplane. There too, it is a good idea to have a low frequency receiver and a knowledge of the radio range structure where you fly.

If you plan to use your airplane often for crosscountry flying, you should decide what kind of performance you want; an early Taylorcraft that cruises at 85 mph may be the most economical airplane on the market, but it certainly would not take you to your destination in record time.

Arrangement and roominess of cockpit should be decided now; side by side or tandem, two-place or four? Know how much importance you attach to such things as visibility, comfort, noise, baggage space, interconnected controls, conventional landing gear or tricycle, all-metal or fabric covering, high wing or low.

ONE prospective buyer was talking to an airplane dealer recently who mentioned some of these thoughts about airplane-buying to him. "High wing?" the buyer said with a sour look. "What good could anyone see in a high wing airplane?"

He discovered that he simply would not own a high wing airplane, and his choice was made much more simple for him because of it, for there are just not many used low-wing aircraft for sale nowadays.

Some pilots' preferences would rule out

(Continued on page 80)

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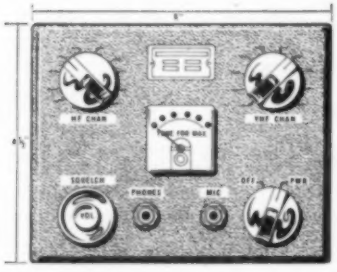

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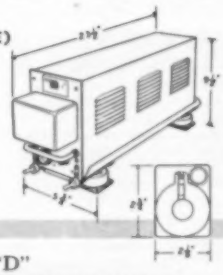

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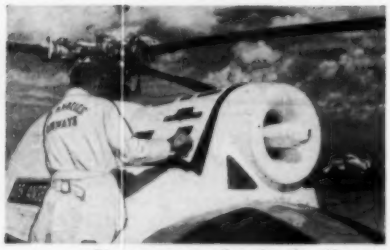

Photos, courtesy Los Angeles Airways, showing new Sikorsky S-62.

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(Continued from page 79)

an airplane with interconnected controls. Though interconnecting is scarcely noticeable in flight and can be easily over-ridden, it is somehow irksome on the ground for them to press the rudder pedals and watch the stick move from side to side.

So you know. Cut the ropes now and walk into the sunshine of the first airport on your list.

Here's an airplane standing on the grass with a FOR SALE sign on the inside of the windshield. It falls generally into the category and price range of the airplane you want to buy. Right now, look for three things. Look at the condition of the airplane, look at the airplane and engine logbooks, check the date of the last periodic or annual inspection.

AIRPLANE buying is fortunately much different than automobile buying in one important respect; if the airplane looks as if it is clean and in good condition, it very likely is actually in good condition.

It is important to check the logs to see how many hours the engine has been operated since it was new or last had a major overhaul. It is important because a major overhaul can cost from $500 to $700 on our four-cylinder engine, and that amount should be deducted from the price of an airplane needing such work soon.

The conditions under which the airplane was operated is also an important consideration. Flying from a dirt strip or consistent runups over loose dirt or gravel will almost surely lead to nicked propeller blades and scratched and pitted paint along the fuselage. Scratched paint is only unsightly, but a nicked propeller can cause some anxious moments. It is from these little nicks in a metal propeller that cracks develop, and when you consider the centrifugal force exerted on a blade turning up two thousand rpm, it isn't inconceivable that the pilot could suddenly be sitting behind half a propeller and looking quickly for a good place to land.

Operation over dirt fields does not help the engine at all, and it is possible for dirt in the engine to shorten its life as much as fifty per cent.

"An airplane will show any maltreatment it has had," one dealer said. "I can't think of a single airplane that we have taken in trade that looked clean and good, and that had good logbooks, that was not actually a very good airplane. It's the airplanes with long periods of flying in their logs, yet have no entries for maintenance or even oil changes, that make us take a long second look at them."

When you walk around the airplane that might be yours, check on the cleanliness of the engine and oil as well as for tell-tales like wrinkled skin that speaks of cracked or broken ribs or frames beneath. Look for dark black streaks aft of the exhaust stacks, which indicate that the engine is due for new piston rings, at least.

Other than giving an indication of just about how long the airplane has been standing in one spot, outside dirt is of little importance. Dirt constantly accumulates on the outside of the airplane, and colors, especially red, oxidize quickly, yet neither dirt nor oxidation affect the basic quality of the airplane.

It is generally a good investment to hire an A&P mechanic to come out with you to look over the airplane, if it looks like it might be the one you want to buy. If he turns up an indicator that the airframe or the engine is due for a substantial bit of maintenance, you will have saved yourself quite a bit more than the cost of an hour of his time.

If it is a fabric covered airplane and all else looks good, you are entitled to ask for a fabric check on the covering. Although this means that holes must be punched in the fabric, and then the holes patched and painted over, it is well worth the trouble. If your A&P finds that the fabric checks well, you know that you have from two to three years of flying left in it, even when the airplane is tied down in the weather without a cover. The cost of having an airplane recovered often can exceed the original purchase price of the plane.

If the airplane has not been licensed recently, go to an FAA repair station and see if there are any recent bulletins to be performed on the plane. These modifications to the engine and airframe, required by the factory or company that builds them, must be performed whenever an airplane is licensed, and should be performed by the owner of the plane at the time the bulletin is published. When the airplane is purchased from a reputable aircraft dealer, the bulletins will most probably have been performed, although the dealer is not required to perform them.

So you have found the airplane; the price is a fair one, the condition of the aircraft is good, the logbooks are in order and show consistent care and all bulletins have been performed. Before you take your wallet from your pocket or sign on the dotted line, fly the plane; see what it feels like in the air. Does the engine check out well in the runup? Does it take throttle smoothly on takeoff? Are the controls rigged so that the plane will fly straight and level in hands-off flight? Do the radios work as well in the air as they do on the ground? Is the cockpit too noisy to ever get used to? Is there enough brake for good control?

IF it is built by a manufacturer still making airplanes, you can write for a flight handbook for your airplane, if there isn't one already in the mapcase. Without knowing the manufacturer's tips and recommendations for operation of his airplane, it is possible to unknowingly cause your own maintenance problems.

The tightly-cowled engines of some Cessna models, for instance, can be easily overheated by excessive operation on the ground. The engine is overheating even as the pilot waits for the oil temperature needle to come into its operating range before takeoff, and he shortens engine life during the very minutes he tries to prolong it. If you have a handbook, though, and follow its recommendations, you cannot possibly hurt the airplane through your own operating procedures.

When you shut the engine down after your test flight, and before you open the door and step down to the grass, ask yourself one more question. Does this airplane feel as if it could be *your* airplane? If it does, if it really does, buy it. You have found your friend. END

Vector Analog

(Continued from page 47)

to the ship, the 10-mile radius was used for initial contact.

From our southeasterly heading the intersection of the pointers placed the ship another 12 degrees off to our right and almost at the instrument's edge. In using the instrument alone, mileage to the destination can be readily interpolated. However, when the face is set to represent a larger area, it is best to use the "Distance to Way point" indicator for accuracy. Located to the left of the panel, the indicator translates voltage into mileage. In being able to change the readings received to mileage, the pilot can gain almost pinpoint accuracy in determining his distance to go. Present plans call for the placement of this unit and its accompanying ground-speed indicator into the instruments' upper corners as digital counters. The indicator showed our position to be nine miles from the ship.

Since the computer will solve all vectors, wind is no problem. The knob in the instrument's lower right hand corner was turned until the vertical pointer cut the center of the face of the area. South then became a zero index and we had only to hold the nose of the aircraft along the vertical rod to our destination. At this point the width of course can be narrowed to two miles to detect lateral shifts in our position. Although the width of course selector has a one-mile setting, its accuracy in the prototype could not be relied upon to any appreciable degree. Refinements to bring the course width down to a mile, or less, with accuracy, are expected to be incorporated in the later models.

Our symbolic aircraft aligned itself in a position on the instrument indicating the aircraft's actual position over the ground to maintain its track. We could then readily discern the wind direction and compute its force mathematically with ground speed.

As we crossed over the light ship by visual reference, both pointers crossed at the center of the instrument. In essence the VORTAC station was re-erected at the light ship, yet the "zone of confusion" normally found during station passage was eliminated.

At the ship a holding pattern was established using pylon turns. By placing the intersection of the pointer on a wing tip of the miniature representation, or any of the wing dots, an orbit at a specific distance from the destination can be flown with accuracy.

AFTER Preston, coordinates of the Statue of Liberty and LaGuardia Airport were sequenced in to complete this phase of the evaluation.

In all instances the computer proved remarkably accurate.

During the flight's second phase the prototype pictorial display was employed with VAC. The Idlewild VORTAC, back in operation, was tuned in as the base station. Our new flight plan was over the north shore of Long Island to Glen Cove, to Riverhead Radio, parallel the Victor 16 Airway, then cross Long Island Sound to Fairfield, Conn. and return to LaGuardia.

The display gave a fine account of our ground position between check points. A pen and ink pointer was used to trace our course on the standard navigation chart cut to fit into the display. Difficulty arose, however, in turns. The pen failed to keep up with the progress of the aircraft—falling off the track of the turn repeatedly. Its reliability, at this stage of development, had to be discounted for heading changes, and VAC had to be used almost exclusively to accurately complete the evaluation.

Returning to LaGuardia for landing, the Analog Computer was set up for a straight-in approach to runway 22. This was done by sequencing in the coordinates of New Rochelle, LaGuardia Radio, and the approach end of 22. The vertical pointer was used as an extension of the runway and the course width was set at two miles. The approach was made down to altitude of 50 feet, with the runway straight ahead, before contact with the station was lost. Loss of the signal is indicated by the gyration of the pointers. A warning flag will be incorporated in the later models to give the pilot an immediate notification of this situation.

Of course the approach is not the real function of VAC. To perform in this manner the instrument has to be refined to the much narrower course width mentioned earlier. The approach, however, does reflect the large degree of precision engineering that has gone into the instrument's other phases, and did leave the impression that with VAC in the aircraft there can be a greater degree of versatility used for entry into an ILS approach. This, too, could coincide with a much needed revision of the route structure as it stands today. END

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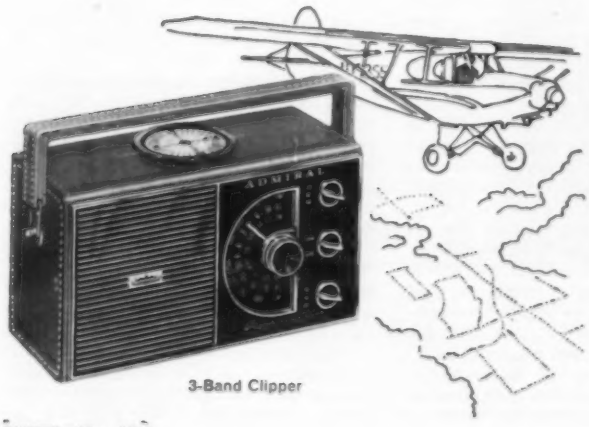

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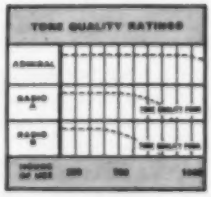

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Fuel Injection

(Continued from page 23)

as far back as 1937 for the Continental W-670 seven-cylinder radial and later, as optional equipment, on the Continental flat fours such as the A-50, A-65, A-75 and A-80 series. Simultaneously, Lycoming was also experimenting with fuel injection, having equipped several of their military engines with this system. Among them was the 36-cylinder radial XR-7750, which still stands as the largest piston engine ever produced.

During World War II, German Daimler-Benz DB. 603 inverted V-12 liquid cooled engines, used in a number of Luftwaffe aircraft types, were equipped with the Bosch fuel injection. These engines operated quite well on 90 octane fuel, instead of the 115/130 grades used by the Allies. In the meantime, the Bendix Corp. developed a fuel injection system for the Wright R3350 engines used in the Boeing B-29 bombers, and the majority of these engines presently flying on commercial airlines have the Bendix Direct Injection system.

Fuel injection systems fall into two categories, continuous and intermittent flow. In both systems, the fuel is injected directly into the cylinder head or induction manifold, just ahead of the intake valve, by injector nozzles when the intake valve is open. The principle difference is in the fuel delivery cycle.

The intermittent flow fuel injection (also known as timed injection) is based on the principle used in compression ignition diesel engines in which a properly timed and metered fuel charge is delivered to each cylinder. This system requires a special fuel pump which accurately meters the fuel. Inasmuch as the gasoline engine unlike the diesel does not depend on compression to ignite the fuel, the time of fuel delivery is not too important.

THIS is the basic principle of the continuous flow injection system. Fuel is fed continuously under pressure to the nozzles. An ordinary vane type fuel pump is used in this system, and as its capacity is usually higher than demanded by the engine, excess fuel is returned to the tanks. Fuel lines and nozzles are always filled with fuel, providing instant acceleration to the engine as soon as the throttle is advanced, as well as greatly simplifying starting procedure. The system starts spraying fuel into the intake ports as soon as the throttle and mixture controls are open and the auxiliary pump is turned on. This eliminates priming, which is necessary to fire up a carburetor-equipped engine.

In both systems, engine regulation is achieved by means of throttle valve located in the air induction manifold. Mixture control can be manual or automatic according to pilot preference.

On supercharged engines the fuel is discharged into the eye of the impeller by a single nozzle inserted through the blower case. For safety reasons, mixture control is automatic in order to avoid the chance of obtaining an improper mixture ratio, which can have disastrous results.

Today there are several fuel injection units available. A number of them are produced by aircraft components manufacturers and one by an aircraft manufacturer. The majority of the systems employ the continuous flow injection principle. Those now in use include:

- *Continental Motors Corp., Aircraft Division.* This is a continuous flow system used in a variety of Continental powerplants. It employs a rotary vane fuel pump incorporating a vapor separator where by swirling motion fuel vapor is separated and only liquid fuel is fed to the pump. Vapor and excess fuel is returned to the tanks. As the positive displacement pump is driven by the engine, any change in engine speed affects proportionally the flow of fuel. A check valve is provided so that boost pressure to the system can by-pass the engine-driven pump for starting. This permits use of auxiliary fuel pump for starting and in the event of main pump failure. The check valve—by-pass feature also has the function of suppressing vapor formation under high ambient temperatures.

FUEL from the main pump is delivered to the fuel air control unit which contains the air throttle valve, a fuel metering valve and mixture control valve. This device controls engine air intake, and sets the metered fuel pressure for proper fuel/air ratio.

From the fuel-air control unit the fuel mixture enters the manifold valve, from where the charge is distributed to the individual cylinders to the spray nozzles, one for each cylinder. A diaphragm and plunger valve raised or lowered by fuel pressure variation, opens or closes the individual fuel supply ports.

- *Bendix RS Fuel Injection System*, manufactured by the Bendix Corp. is also a continuous flow type. It differs mainly from the Continental system in that it employs the principle of measuring the air flow and using the air flow signal to operate a servo valve. The servo valve accurately regulates fuel pressure and makes fuel flow proportional to air flow. Principal parts of the system are the vane type fuel pump, air flow sensing system (air intake with throttle valve) fuel control, incorporating mixture control and the servo regulator. The last three components are contained in the throttle body casting. Metered fuel from this unit is delivered to the fuel manifold valve from where it is distributed to the fuel nozzles equipped with air bleeds.

- *Simmonds 570 and 580 Fuel Injection System*, manufactured by Simmonds Precision Products uses the intermittent principle. An injector pump delivers a timed fuel charge to each cylinder intake port. The system was developed originally by the SU Carburetor Co. in England, in the early 1940s, and was used on the Rolls-Royce Merlin engines. Simmonds brought the SU injector to this country after the war and adapted it to U. S. requirements.

The heart of the system is the injector pump containing several plungers which deliver the fuel charge to each cylinder. The main pump shafts is driven at engine speed and the plungers are operated by a wobble plate the stroke of which is controlled by manifold pressure and temperature. (In the model 580 it is also controlled by ambient air pressure to provide altitude compensation.) A capsule assembly senses the pressure and temperature, adjusting the angularity of the wobble plate and thus

varying the stroke of the plungers.

Fuel from the individual plungers is distributed to the nozzles by means of a valving system so that with the pump running at engine speed, each plunger delivers the fuel to two different cylinders on alternate strokes. Therefore only half as many plungers are needed as the number of cylinders.

The fuel nozzles incorporate needle valves held closed by spring tension until a shot of fuel arrives from the plunger.

● *Simmonds 530 Fuel Injection.* This is a continuous flow system in which the amount of fuel metered to the engine depends on throttle position and engine speed. Mixture control is manual and, as in all manually operated continuous flow systems, monitoring of mixture is by means of pressure gauge which acts as a flow meter.

● *A.C. Spark Plug* fuel injection features speed sensing by a "free ball" governor and a fuel system that eliminates vapor return lines. It is a throttle actuated continuous flow injection. The function of the speed sensing governor is to monitor any change in engine speed and automatically increase or decrease fuel pressure to the air/fuel control assembly. Not commercially available at the present writing.

ALL the above mentioned systems have proved extremely reliable and have boosted the performance of aircraft powerplants considerably over those equipped with carburetors. In most engines, fuel injection gives increased altitude performance by gaining the power normally lost through pressure drop in the carburetor. Another advantage is that fuel injection affords a wide latitude in manifold design to permit a substantial increase in power from the same engine. As an example, the Lycoming IO 540 engine delivers 290 hp compared to 250 hp available from the normally carbureted O 540.

In addition, the fuel injection system can be so located that engine height is reduced by as much as six inches, permitting slimmer nacelles and better streamlining.

Though icing through fuel vaporization is not present in injection equipped engines, atmospheric ice, which usually forms while flying through heavy rain, snow or ice in temperatures near 32 degrees F, may restrict the air inlet scoop and cause power loss.

An alternate, protected air supply and/or heat is usually provided in the aircraft engine section which quickly cures the situation. END

AIRCRAFT ENGINES USING FUEL INJECTION

Engine	Injection system	No. of cyl.	Horsepower	Application
Continental IO 470-C	Continental	6	260	Beech Bonanza M35
" IO 470-D	"	6	260	Cessna 310F, Meyers 200B
" IO 470-E	"	6	260	Cessna 210
" IO 470-F	"	6	260	Bellanca 260, Cessna 185
" IO 470-H	"	6	260	Navion Rangemaster
" IO 470-J	"	6	225	Beech Debonair
" IO 470-L	"	6	260	Beech Baron
" IO 470-M	"	6	260	Aero Commander 500A
" IO 470-N	"	6	250	Beech Bonanza N35
" IO 470-P	"	6	250	Lane Riviera
" TSIO 470-B	"	6 turbo-supercharged	260	Lockheed LASA 60
Lycoming IO 360	Simmonds 530	4	180	
" IMO 360	Simmonds 580	4	225	Aerojet SD2 Drone
" IGSO 480	Simmonds 570	6 supercharged	340	Beech Queen Air, Twin Bonanza J50
" IO 540	Bendix RS-10	6	290	Aero Commander 500B
" IGO 540	Bendix RS-10	6	350	Aero Commander 560F
" IGSO 540	Simmonds 580	6	380	Aero Commander 680F
Pratt & Whitney R985	Simmonds 580	9 radial	450	Conrad 9800 (Twin Beech conversion)

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AIRMAIL REACHES US OVERNIGHT

Ft. Worth Controversy

(Continued from page 33)

of that traffic over there is due to Fort Worth, Tarrant County and West Texas," says V. W. Boswell, chairman of the Fort Worth Chamber of Commerce's Aviation Committee. "Normally they would be taken out of Carter Field, but due to lack of services at Carter Field they've moved over there."

Among other things, the Fort Worth partisans charge that the airlines deliberately steer customers to Dallas' Love Field rather than to Carter Field.

Actually, though, Fort Worth had a chance in late 1960 to prove its controversial point that the city was just waiting to support good service from Carter.

American Airlines in the Fall—over their bitter protests—was ordered by the Civil Aeronautics Board to start non-stop jet service between Fort Worth and Washington and New York. In ordering the flights, the CAB said:

". . . There is such a disparity in the calibre of service offered at Fort Worth as to make it inevitable that Fort Worth traffic will patronize Dallas service in preference to its own."

American Airlines inaugurated a non-stop Electra schedule between Fort Worth and Washington. But after a couple of months it notified the CAB that it was discontinuing the service, effective with the start of 1961. It gave as its reason the fact that it has been flying the 68-passenger planes with an average of 14 passengers on board.

"This meant an indicated total loss at the rate of approximately one million dollars annually," the American Airlines letter told the CAB. "With the operation this far from financial feasibility, there is no need to await further experience—and further large losses—before cancelling the flight.

Likewise, a couple of years ago in a brief to the CAB, Braniff reported that its eight-months' experience with a New York-Fort Worth flight was "abysmal and proved beyond a shadow of a doubt that there is no substance to Fort Worth's constant assertion that it would produce more traffic if only the airlines gave it more service at Amon Carter Field." Braniff said that 97 per cent of the time, its Flight No. 1, a one-stop service from New York, arrived at Fort Worth with more crew members than passengers. It said its experience with other schedules between Fort Worth and New York was "equally bad."

At the same time, Delta told the CAB that "inter-city rivalry" is the real basis for Fort Worth's complaint of inadequate air service, "rather than pure inadequacy of service at Carter Field for the Fort Worth originating and terminating traffic potential."

Fort Worth is particularly incensed over the lack of what it regards as proper jet plane flights. It's trying to get more, hitting hard with its theory that Carter loses passengers because there are no convenient jet schedules, and loses flights because there are no passengers.

To try and get better service Fort Worth officials are swinging in many directions. This past summer, for example, Fort Worth's city manager, L. P. Cookingham, in a sharply worded letter to Braniff President Charles E. Beard told the airlines that it would either have to serve Fort Worth with jet flights at Carter Field or pay for the use of the field for training flights. All of Braniff's jet flights into the area stop only at Love Field.

At the same time, Fort Worth launched an all-out civic drive to get more people and planes to use Carter with the battle cry, "Fly Carter—It's Smarter!" Bumper stickers were given to motorists. Business firms pasted small stickers to their letterheads. Posters advertising the airport have been placed all over town.

Another step toward boosting Carter Field traffic is a citywide speaker's bureau. After the talks, the audience is asked to "take a pledge" to use Carter Field schedules. Pledgers are given a wallet-sized card identifying them as active supporters of Carter Field. On the reverse side of the card are spaces for listing five flights taken to or from Carter Field, even though flights at other airports might have been more convenient. When all five spaces are filled, the card is returned to the Fort Worth Chamber of Commerce and the holder gets a plaque for community service.

The Fort Worth City Council also has approved an order that city employees on official business shall not take off from Dallas' Love Field. In another direction, Fort Worth has extended an invitation to Trans World Airlines to provide Carter Field with exclusive service.

CONRAD MAKES THREE IN ONE

IN THE SKILLFUL hands of that indomitable Man of Records, Max Conrad, a Piper Aztec broke ground at Miami (Fla.) International Airport in the early hours of February 27 last, and headed westward on the first leg of a round-the-world speed record attempt for piston powered airplanes. The first refueling stop before heading over the Pacific for Honolulu was Long Beach, Calif., 2,326 miles. With Conrad was New York newscaster Dick Jennings (*center*) as the official NAA observer.

At 3 a.m. March 8, eight days, 18 hours, 36 minutes, and 25,946.3 miles later, the Aztec touched down at Miami to be greeted by an enthusiastic throng led by William T. Piper (*left*). In this single flight Conrad had captured, by a wide margin, three records previously held by the late Peter Gluckmann of San Francisco: (1) World "Class" record for piston-powered airplanes regardless of size; (2) World Class C-1-d record for aircraft weighing between 3,858 and 6,613.9 pounds; and (3) National (U. S.) record for speed around the world.

Overall ground speed, based on total elapsed time, was 123.2 mph; 160 hours and 34 minutes had been spent in the air; 50 hours and two minutes on the ground. Of the 13 legs on the flight, the longest 2,433 miles Singapore to Bombay took 17 hours, 19 minutes. The most difficult, according to Conrad, was over the desert from Lagos to Dakar when, due to fever induced by an infected injury to his left leg, he suffered a prolonged spell of hallucinations. Then over the South Atlantic from Dakar, a blown fuse rendered the long range radio inoperative, necessitating an unplanned stop at Amapa in Brazil, causing some delay. Otherwise, the trip was "routine"—for Max, that is.

Aztec N4544P powered by two 250-hp Lycomings carried a fuel load of 432 gallons. Its total takeoff weight was 6,160 pounds. Its radio equipment included an ARC ADF; Collins VHF and VOR navigation equipment; a SunAir multi-channel transmitter/receiver and a Piper AutoNav, radio direction finder. It was also equipped with Goodrich de-icing system.

Despite the apparent beating it is taking on scheduled airline service, with the accompanying drop in passengers using its facilities, Carter Field is far from striking out completely.

For one thing, in March, 1960 the FAA approved a $907,500 grant, to be matched by local funds, for lengthening of a Carter Field jet-use runway to 9,200 feet. At the same time the FAA decided not to grant a Dallas request for $2,800,000 for airport improvements, saying that Love Field does not have enough clear area at the end of its present and proposed landing strip, and that the new strip, to be 8,000 feet long, would not be long enough to handle bigger jet airliners of the future.

Carter Field also serves as a regional maintenance base for American Airlines, although the work force is being cut there as the airline retires its piston planes and concentrates its jet overhaul and maintenance at Tulsa. Central Airlines, a local service carrier, is headquartered at Carter, with an office building and big hangar, built under a lease arrangement.

American Airlines' Stewardess College is also located at Carter, as will be the FAA's new Air Route Traffic Control Center. Recently, too, Southwest Airmotive Company, of Dallas, has proposed construction of a $500,000 facility for private planes at Carter. Private and business flying is on the rapid rise.

Meanwhile, despite the turn-down by the FAA for runway extension funds, Dallas is going ahead on its own financed-program of improvements. Construction is expected to start soon at Love Field on a new parallel runway designed to ease the burden of stacked up traffic. It will be 9,400 feet long, compared to the 7,751-foot-length of Love's longest runway now.

"This new runway, together with present strips, are long enough to handle the kind of traffic we anticipate for Dallas," says Dallas Aviation Director George Coker." We do not consider any 3,000 and 4,000-mile flights from Dallas. These are the only ones that might require longer runways because those planes would be carrying heavier loads of fuel on takeoff."

Carter has two main runways—8,450 feet and 6,400 feet. The value of this airport property—not counting the facilities of the firms occupying its facilities, including modern hangars—is an estimated $25,000,000 at today's costs.

Aside from its modern terminal, Dallas' Love Field has nearly $11,000,000 worth of operations and maintenances bases within its perimeters. More than $9,000,000 was spent to provide such facilities for Braniff, Delta and American and another $1,500,000 was spent for a business flying terminal for Southwest Airmotive.

Each of these projects was financed by the City of Dallas through sale of revenues, with rentals received by the city amortizing the bond issues during the life of the leases.

Behind these two modern and highly competitive airports is a quarter-century of expensive bickering. In 1927 the Federal government was laying out a network of airmail routes. Dallas proposed, that year, that the two cities establish a joint airport and go after some of this business. Fort Worth turned down the proposal. In 1928, Dallas went off on its own, bought what re-

(Continued on page 86)

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(Continued from page 85)
mained of Love Field, a World War I Army training site, and established it as one of the first municipal airports in the nation. The city paid $350,000 for the 350 acres and old wartime buildings.

A dozen years rolled by. Air transportation grew. Fort Worth established its own municipal airport. Early in World War II—backed by both the airlines serving the area and the Civil Aeronautics Administration—proposals were advanced that a new, more modern airport be built exactly mid-way between the two cities, designed to serve both. That set the stage for the fight that still is continuing. It was on-again-off-again for years.

First one city would agree, then another to a joint airport.

There was no question that Fort Worth needed a new airport. It had been suffering ever since the coming of the big four-engine airliners. The city's Meacham Field was too small for them and the major airlines had moved most of their trans-continental flights to Love Field.

Fort Worth opened its new Amon Carter Field in 1953, but it never caught up with Dallas' Love Field in traffic. The difference in traffic figures between the two airports has widened every year since.

At one point Fort Worth offered to sell Dallas a half interest in its Carter Field—if it would be made the airline terminal for both cities. Dallas refused, calling it a plan for them to "bail out" Fort Worth from an impossible situation. Fort Worth took this as an insult. The breach between the two cities on airport matters widened.

While the bitterness and costly duplication of many facilities is still high between Love and Carter, impartial aviation authorities predict that there may very well be a bright future for both airports. They base their predictions on the population and industrial growth of the area.

"The way things are going," says one, "there's going to be enough business for all. In fact, a third airport may be needed in a few years to handle the traffic." END

G-E Turbines

(Continued from page 38)
in 500-mph-plus speeds.

Other applications of SAED turbines could include aircraft produced by Piaggio (Italy), Douglas, Boeing, Beech and Cessna.

As compared with available turbines, the aft fan, emphasizes James N. Krebs, SAED project manager for the CF700-CJ610, to FLYING, will: 1) Increase range by 15 to 20 per cent; 2) Decrease field length by about 20 per cent; 3) Double commercial airport capability (fixed runways); 4) Reduce "perceived noise"—community or external, not cabin—by some 40 per cent.

A derated CJ610, with takeoff thrust of 2,400 pounds, will take a 10- to 12,000-pound gross weight aircraft over a 50-foot obstacle in between 1,700 and 2,000 feet, FLYING was told. Engine-out over the same 50-foot obstacle would run about 2,700 feet.

Bypass ratio of 2 to 1 is considered the optimum. Engines also will accelerate from idle to full power in five seconds (requirement calls for idle to 95 per cent power in five seconds; then an additional second to coast to 100 per cent power). The aft-fan CF700 will provide "50-50 thrust"; that is, fan air out 50 per cent and engine air out 50 per cent.

There are only minor changes in the gas generators of the civil versions, as compared to that of the military J85, a compact engine with an axial flow eight-stage compressor coupled directly to a two-stage turbine. Incorporated is a through-flow annular type combustion system, plus controlled compressor interstage bleed. Compressor airflow is regulated, and rapid speed transition assisted, by variable inlet guide vanes and variable interstage air bleed valves.

Rotor rpm is 16,500 (100 per cent) for the gas generator; the fan rpm, on the CF700, is 8,800. Mass-flow is 42.5 pound/second and pressure ratio runs to 7 to 1. The stall pressure ratio is 8 to 1. The variable inlet guide vanes are anti-iced. Inspection and maintenance is aided by a horizontally split stator casing.

Over-temperature protection is through a louvered liner incorporated into the through-flow combustor. An optimum spray pattern is set by 12 dual-orifice "duplex" fuel nozzles. There are two "inspection ports."

NEW COMMANDER 560F

THE AERO COMMANDER 560F, built for best performance at altitudes under 10,000 feet, is a worthy complement to her high-altitude sister, the Commander 680F. In fact, the 560F offers a higher initial rate of climb and shorter takeoff roll than the more powerful supercharged model.

The new Commander has the same airframe of the 560E, but is fitted with two 350-hp Lycoming IGO-540-B1A fuel-injection engines. This change over the 295-hp engines of the 560E coupled with flatter nacelles, above-the-wing exhaust, and fully-recessed landing gear make the only visible difference between the E and the F; Aero Commander is well satisfied with its basic airframe design.

The first production model, N6128X, demonstrated her ability to a FLYING editor-pilot during a rainy flight from Newark Airport. At a light 6,580-pound gross weight, the 560F used 900 feet of Newark's runway 11 to lift into the air. With Air Carrier Service Corporation's Chief Pilot Jim Cater as the only other occupant of the aircraft, the new Commander seemed quite overpowered and climbed at a surprisingly steep angle, giving 2,500 fpm at 140 mph. The aircraft passed through 800 feet as it crossed the end of the runway. Though the outside air temperature was cold (36 degrees F), this rate of climb was higher than it should have been; company tables indicate that a 2,000 fpm climb should be expected at that temperature, and that only at 120 mph and quarter flaps. Maximum sea level airspeed of the 560F is 248 mph.

Cruise control is very simple with the fuel-injection engines. A fuel flow gage marked with arcs for power at any per cent of maximum continuous engine output eliminates the need for referring to cruise control charts to get best performance.

At 4,000 feet and 55 per cent power, the left engine was reduced to zero thrust. Yaw was barely apparent, and only a touch of right rudder was necessary to correct the Commander back to straight flight. Power on the right engine was increased to 75 per cent, and the rudder required more pressure.

At cruise altitude, the precipitation was freezing rain and the windshield became almost completely iced over. The heater was started and the defroster put to work.

Six minutes later, turning to final approach at Newark, there was a small arc of cleared glass around the defroster outlet. A go-around was made, and by base leg of the next approach, over half the windshield had been cleared of ice. Although there was a light accumulation of ice on wings and tail, approach speeds were flown as normal, with 100 mph over the fence.

Commander performance tables call for a landing roll of 1,525 feet using maximum braking; the 560F stopped in approximately 1,700 feet with light braking. The 560F, which Cater calls "a little airliner", lists at $98,500 without radio. Her good performance and seven-passenger capability indicate that the 560F-method could be an economical way to travel.

RICHARD BACH

Engine bay temperature is held down by an external insulation blanket. And the two-stage axial-flow turbine is cooled by compressor bleed air. The turbine blades are solid. The shank-type design moves the turbine wheel away from the hot gas stream.

Each wheel of the rotor is connected to the adjoining wheel; the rotor drive is from one wheel to another. The front shaft is bolted to the first-stage wheel and the turbine shaft is attached to the fourth-stage wheel. The first-stage blades are pinned; the others are dove-tailed (but non-rigid) to allow for expansion and to avoid vibration. Rotor blades can be replaced, without taking rotor apart, by pulling off the front end. By removing half the case at a time the stator blades can be replaced. Both gear box and control system can be removed as a unit.

A positive displacement, pressurized and re-circulating system lubricates the engine. Source of supply is a single oil tank. Oil consumption—maximum—is .60 pound/hour. Engines are electrically started.

Power for CF700 accessory drives is transmitted through a radial shaft in the main frame to the transfer gearbox, then forward through the gearbox connecting shaft to the accessory gearbox. The mounting pads are furnished on the accessory gearbox. An additional pad is provided at the rear of the transfer gearbox for desired air frame accessories.

The CF700 main fuel control, mounted on the fuel pump, is hydromechanical in nature consisting of a computer section and fuel regulating portion which utilizes fuel pressure as a power source for all control servo functions.

The main fuel control computer section positions the metering valve of the fuel regulating device as a function of compressor inlet temperature, compressor discharge pressure, engine speed and power lever angle. The fuel regulating portion of the main fuel control—consisting of fuel screens, filters, constant pressure drop regulator, metering valve and stopcock—provides required flow to the engine at all times. The fuel pump itself is mounted on the engine pad, applying fuel to the main fuel control.

The CJ610 ignition system consists of a capacitor discharge type ignition unit, mounted at the top of the engine, with two secondary cables and an igniter plug for each.

A combustor casing shield can be provided as optional equipment. Within the shield is the annular combustor of the gas generator, consisting of an inner casing, a liner and an outer casing. Ports in the outer casing allow periodic inspections. The two-stage turbine, used to drive the compressor, is housed within a cylindrical turbine casing. The casing is also split along the horizontal center-line to facilitate inspection and maintenance.

General Electric long-life testing includes some 1,000 hours (at this writing) on each of two compressors—rotors and stators—on which they are deliberately piling up time. SAED also has a 1,000-hour test underway on the turbofan CF700; of which the first 350 hours have been completed. Several more 1,000-hour tests are planned, including "abusive tests" in which the engines constantly run overspeed, over temperature, through hailstone ingestion (iceball blasts), water ingestion, other "torture tests."

The safety factors incorporated into these engines are typical of the advanced state of the art evidenced through the industry today. The engineering latitudes involved will meet any given set of aircraft requirements. END

GENERAL ELECTRIC'S SMALL TURBINES

Performance:	CF700-2B	*CJ610-1
Takeoff Thrust (lbs)	4,200	2,850
SFC at Sea Level Static (lb/hr/lb)	0.686	0.970
Cruise Thrust at Mach 0.775, 36,089 ft. (lbs):	900	858
SFC at Cruise Thrust (lb/hr/lb)	0.950	1.14
Weight (lbs)	615	355
Maximum Diameter (inches)	34	17.7
Engine length (inches)	64	39.7

*(The CJ610-2B is but a CJ610-1 derated to 2,400 lbs sea level thrust)

AIRCRAFT APPLICABILITY

15,000 to 25,000 lbs (twin-engine)

Engine Type:	Best for Aircraft in These Gross Weights Class
CJ610-2B	8,500 to 11,000 lbs
CJ610-1	12,500 to 14,500 lbs
CF700	*15,000 to 25,000 lbs †35,000 to 50,000 lbs

*(twin-engine); †(four-engine)

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THE RILEY MODEL 65

RILEY AIRCRAFT'S Model 65 is a re-designed version of the very popular Cessna 310. Airframes from early models are dismantled and re-manufactured to new aircraft standards. Power is increased by the use of new fuel injected IO-470-D Continental 260-hp engines. Range is increased by additional fuel capacity made possible by the removal of the exhaust augmenter system and substitution of an airfoil-shaped 19-gallon fuel tank in that area. Normal endurance is now seven hours at 65 per cent power.

Interior is nicely done in wool and genuine leathers; a cabin length dome light lends modern design to the decor.

Skin friction is reduced to the minimum by sealing all joints and spraying with epoxy, a fiberglass-like substance. Final finish fairly gleams and is perfectly smooth with a complete absence of seams and rivet marks.

The center windshield post is removed for a single-piece windshield.

Two airplanes were flown by FLYING for the evaluation: N310S, a recently purchased standard 310 flown for comparison and N310N, the re-manufactured evaluation airplane. Both models were first built in 1955.

Less cabin noise is the first noticed item—one and one-half decibels lower according to Jack Riley. It is the result of exhausting the engines under the wing and added soundproofing. No cowl flaps are provided, but cylinder heads remained at 350 degrees F or below even in comparatively slow climbs at climb power settings and on single-engine operation.

Stability improvement is marked; the Riley flew hands-off in turns, level flight, or climbs and descents. It maintained its attitude even in mild turbulence found at the lower altitudes. It is the result, according to Riley, of the removal of the augmenters.

Stall characteristics are very good. We did an engine-out stall with the right propeller feathered and the left engine at 65 per cent—it broke at 62 mph IAS! Much better.

At 7,000 feet with an OAT (outside air temperature) of 60 degrees F and 75 per cent power it indicated 195 mph, which trued at 225 mph; this was with four people and 50 gallons of fuel on board. At 6,000 feet, 75 per cent registered a five-mph gain in IAS but a two-mph loss in TAS. Power settings on the Model 65 were 2,450 rpm and 24 inches mp.

With the right engine feathered and 2,300 rpm and 23 inches on the left engine the aircraft indicated 145 mph at 5,500 feet.

According to Riley, the Model 65 consistently trues out at 208 mph at 10,000 feet with 2,000 rpm and 21 inches mp on just 17 and a half gallons per hour.

Price of the re-manufactured airplane is $37,950 not including electronic equipment – competitive with the lowest-priced light twins, yet performing with the highest-priced.

GERALD J. SCHLAEGER

Cessna Skyhook

(Continued from page 43)

mediately apparent as entry to the cabin is made: a step is needed, it is really plush, and the visibility is "control tower" quality. The step-in isn't too bad for a man but, for a lady in a skirt, it could pose a problem.

Cabin appointments and upholstery are in keeping with highest standards for executive aircraft. Front seats are individually adjustable both fore and aft and reclined. The floor and transmission-drive shaft hump are covered with a deep pile carpet. The cabin is large; except for the center mast it could easily seat six in comfort. People can easily change from one seat to another while in flight. A large area behind the rear seats provides for baggage and small cargo.

The expanse of plexiglass allows for excessive vision. But with so much glass area which cannot be soundproofed (as in the cabin area itself) there is a price—a noise level that seemed slightly above the norm. Visibility is excellent.

Mag drop on the 270 Continental was

negligible and engine and rotor operation was smooth. Thirty-eight and a half inches manifold pressure is allowable for takeoff, but with two people and 40 gallons of fuel on board we became airborn at about 28 inches mp. The Rotorcraft, which has a nice feel, isn't the least bit skittish and is quite stable in a hover.

The outside air temperature was 34 degrees F with some shower activity in the area. The cabin remained comfortably warm during the flight; a warm air outlet is located on each side of the instrument panel about knee level. Sea level pressure was 30.07 and at takeoff the aircraft was about 300 pounds below max gross, at 2,800 pounds.

The 15-knot SW wind that was blowing put the Skyhook on the edge of translational lift while at a hover; this accounted for a slight beat at hover. There is a pronounced shudder passing through translational lift.

Control response is good in all planes and inflight stability is excellent; even with light turbulence the aircraft could be flown "hands off" for several moments at a time. This stability is attained through the use of a three and a half pound, nine-inch gyroscope mechanically driven through a flexible shaft by the main transmission. It is located beneath the left cyclic stick and is mounted on a single axis; it is interconnected to the cyclic controls to resist roll and assumes 55 per cent of lateral control responsibility.

The pilot, of course, has 100 per cent control responsibility at all times and with hydraulically boosted controls is unaware of any gyro resistance—he just reaps the benefits. This unit can be turned off and the pilot immediately becomes aware of its value for he has to make continuous lateral corrections.

Longitudinal stability is attained through the use of an airfoil-type horizontal stabilizer mounted forward of the tail rotor. It is free floating below 40 knots, above which it becomes interconnected with the longitudinal cyclic and collective pitch controls and trim changes though power and speed changes are reduced in the Skyhook.

Cessna's airspeed is novel and unique to this aircraft—it has a built-in red-line computer. Altitude and weight factors are set in, resulting in the proper red-line for that configuration. At 2,800 pounds and 2,000 feet our red-line worked out to just over 100 knots. We added power and at 33 inches mp and 3,000 rpm we were indicating exactly on the red-line, flight was smooth with no evidence of an impending

(Continued on page 90)

CESSNA SKYHOOK

Specifications:	
Maximum gross weight	3,100 lbs.
Empty weight (std. equip.)	2,080 lbs.
Empty weight (with aux. tanks)	2,095 lbs.
Useful load	1,020 lbs.
Useful load (with aux. tanks)	1,005 lbs.
Fuel capacity (std.)	60 U.S. gals.
(with aux. tanks)	90 U.S. gals.
Lifting rotor diameter	35 ft.
Number of blades	2
Blade chord	13 in.
Disc loading	3.22 lb./sq. ft.
Tail rotor diameter	7 ft.
Number of blades	2
Engine	Continental FSO-526A 270 hp (net after cooling) @ 3,000 RPM & 3,200 RPM to 8,000 feet.
Height to top of cabin	85.9 in.
Height of rotor	96 in.
Overall height	101 in.
Fuselage length	353 in.
Overall length	510 in.
Fuselage width	64 in.
Overall width	99.75 in.

Performance:	
Maximum speed @ S.L. (2,700 lbs.)	122 mph
Cruising speeds	90-120 mph
Rate of climb @ 8,000 feet (Maximum Gross Weight)	1,030 ft./min.
Time to climb from S.L. to 10,000 feet:	
@ 2,700 lbs. gross wt.	7 min. 44 sec.
@ 2,900 lbs. gross wt.	8 min. 50 sec.
@ 3,100 lbs. gross wt.	10 min. 16 sec.
Hovering ceiling in G.E. (standard temperature):	
2,700 lbs.	13,500 ft.
2,900 lbs.	11,600 ft.
3,100 lbs.	9,600 ft.
Hovering ceiling @ max. gross wt.:	
@ 95°F (in G.E.)	6,500 ft.
Range (normal fuel)	260 stat. miles
Range (with aux. tanks)	400 stat. miles
Endurance (normal fuel)	3.37 hrs.
Endurance (with aux. tanks)	5.15 hrs.
Operating rpm range:	
Continuous	2,800-3,000
Takeoff 5 minutes	2,800-3,200

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(Continued from page 89)

tip stall. Maneuverability in flight is good; the proximity of McConnell AFB made all pattern flying at this Cessna strip hold to less than 300 feet. The Skyhook can be maneuvered in complete confidence even to the extent of performing auto-rotations under this restriction. To obtain descent rates and become familiar with the aircraft, we flew away from the congested area.

Auto-rotations from a reasonable altitude, at 60 knots, resulted in a constant 1,600 fpm descent.

Touchdown auto-rotations from a hover gave the pilot little to do but pull up on the collective pitch as the craft approached the ground; touchdown was easy.

The Skyhook was put into an "out-of-ground-effect" hover at approximately 2,500 feet. This was somewhat difficult to maintain and we seemed to be going into and out of translational lift. In this area only it developed a pronounced beat.

In various maneuvers performed during this evaluation, throttle coordination presented no problem. Red-line range is from 2,800 to 3,200 engine rmp, and from 2,900 to 3,000 is desired. For evaluation only, a lift-off was performed at 2,500 rpm and less than 30 inches mp. At 3,000 rpm hover manifold-pressure requirement was approximately 26 inches.

Vertical speed in climb consistently exceeded 1,000 fpm and, with power to 34 inches an l 3,000 rpm, settled on 1,200 fpm.

During the evaluation, N5748 gradually attained an extreme nose heavy condition; there were approximately 15 gallons of fuel, full oil and 380 pounds in the two front seats. It had little effect on the attitude of the Skyhook except when accelerating away from a hover, when the aircraft would assume a very nose-low attitude. At about 30 knots the nose could be raised to a more comfortable attitude and normal climb-out maintained.

Internal fuel capacity is 60 gallons with provisions for 30 additional gallons in streamlined external tanks mounted just aft of the two entrance doors and above the regular tanks into which they feed (this prevents having to run dry on any tank to achieve maximum range). Maximum range with standard tanks is 260 miles at 75 mph, or 400 miles with aux fuel.

THE Skyhook's clutch free-wheeling unit, of conventional roller-cam type, has all bearings oil-lubricated in a sealed separate system. The unit is connected to the main transmission through a flexible coupling to allow motion between the transmission and the engine.

The transmission is simplicity itself; it consists of three spiral bevel gears and six bearings. The housing is magnesium and is shock-mounted to the fuselage beneath the cabin floor. The main rotor shaft runs vertically through the center of the cabin; it and all control rods are encased in a housing but distract little from the Skyhook's amazing 360 degree visibility.

Main rotor blade construction and attachment are unique to the Skyhook. The "spar" is a D-shaped section of chrome moly steel to which has been bonded an aluminum alloy beaded inner skin to form the aft portion of the blade. An outer covering of stainless steel is then bonded over this to form the smooth symmetrical airfoil.

The blades are attached to the hub by stainless steel attaching angles. Four of these "glorified angle irons" are nestled within each other; a cross-section would look like four Ls wedded tightly together. The vertical portion constitutes the leading edge and precludes any flapping (up and down) movement; the horizontal part is below and prevents the blades from hunting (fore and aft movement other than normal rotation).

The angles do not unduely resist twisting and therefore permit feathering (changing pitch angle) of the blades; no bearings are required. The hub is forged aluminum and is hinged at the center of rotation to permit flapping. It is so constructed that the bearings carry only lift and torque but no centrifugal loads.

The control rods come up through the center of the main shaft and are levered through a 90-degree change of direction as they extend outside the shaft and then nestle within the Ls to push and pull causing feathering of the blades. This head layout meets Cessna's prime sales area requirements admirably as it makes for a very clean head section. Helicopters are notorious grease slingers, but the Skyhook's head remained scrupulously clean during the flight.

Only last month Cessna began an eastern and western demonstration tour, using two of its Skyhooks. And Helicopters, Inc., of Denver, Colo., which has service-tested the rotorcraft in mountainous areas, recently became one of the only rotary-wing distributors of Cessna Aircraft. END

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FLYING CALENDAR

May 1-5—Annual "Train for Profit" conference of American Society of Training Directors. Aviation industry training problems will be discussed, Bellevue-Stratford Hotel, Philadelphia, Pa.

May 7—Fly-in breakfast at Middletown Aviation Club house, Hook Field, Middletown, Ohio.

May 12-14—Mid-America Air Fair, Municipal Airport, Wichita, Kans.

May 13-21—Armed Forces Day, featuring open house events at home and abroad by all branches of the U. S. military services.

May 15-16—National Fire Protection Assn. aviation fire safety seminar, technical session aviation committee reports, Hilton Statler Hotel, Detroit, Mich.

May 15-18—Annual national conference, Society of Aeronautical Weight Engineers, Sheraton Hotel, Akron, Ohio.

May 19-22—First annual Fly-in Golf Championship, Fly-in Golf Assn. of America, Lake Texoma Lodge Golf Course, Kingston, Okla.

May 20-21—Annual National Championship Air Show and Antique Experimental Aircraft Fly-in Trophies, Municipal Airport, Gadsden, Ala.

May 21—Fly-in for Flying Farmers and regional aeronautical clubs and Flying Physicians, and airport dedication, Laramie, Wyoming Airport.

May 27-30—Memorial Day Soaring Meet, Wurtsboro Airport, Wurtsboro, N. Y. Contact Alex Dawydoff, 30-21 48th St., Long Island City 3, N. Y.

May 27-30—Annual Wright Memorial Glider Meet, Soaring Society of Dayton, Inc., Far Hills Branch P.O. Box 581, Dayton 19, Ohio.

May 27-30—Annual Jim Swearengen Soaring Contest, Twinkletown Airport, Walls, Miss.

May 28—Annual Fly-in breakfast, Willmar Municipal Airport, Willmar, Minn.

May 28—Fly-in breakfast, new Pine Beach Airport near Brainerd, Minn., sponsored by Brainerd Flying Club and Ruttger Lodge. Rain date June 4.

June 3-4—Annual Pendleton Aviation Day and Fly-in by Umatilla Aircraft Owners' and Pilots' Assn. and Pendleton Chamber of Commerce. Pilots' clinic and banquet the 3rd and breakfast and air show, the 4th.

June 3-4—Annual Fly-in, Chapter 24, Experimental Aircraft Assn., Tulakes Airport, Oklahoma City, Okla. Contact EAA, 7008 NW 62nd St., Bethany, Okla.

June 3-4—Midwest EAA Fly-in, Muscatine, Iowa Airport. Rain date June 10, 11.

June 4—Annual Fly-in breakfast and Air Day, Magnolia Municipal Airport, Ark. Rain date June 11.

June 4—Annual Fly-in breakfast, Wainwright, Alberta, Canada by Wainwright Flying Club. U. S. visitors welcome.

June 4—Breakfast Fly-in, Kerner Airport, New Petersberg, Ohio by Kerner Pilot Assn. Rain date June 11.

June 4—Fly-in drive-in breakfast, Reedsburg Comp. Sq., Civil Air Patrol, Reedsburg Airport, Reedsburg, Wis., 0700 to 1230 hours.

June 4—Michigan Flying Farmer Dawn Patrol, Midland, Mich.

June 8—Annual Women's National Aeronautical Assn. Skylady Derby, Tulsa, to Little Rock, Springfield, Mo. and Tulsa.

(Continued on page 92)

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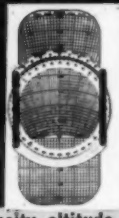

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Flying Calendar

(Continued from page 91)

Contact Mrs. Pat Bauer, 528 So. 108 E. Ave., Tulsa, Okla.

June 10—Holman Air Derby, Holman Field, St. Paul, Minn., sponsored by St. Paul Jr. Chamber of Commerce. Contact Jerry Brown, 120 Administration Bldg., Holman Field.

June 10-11—Fly-in to Defiance, Ohio, with Sat. night dinner, Sun. breakfast and air show, by Sky Ramblers Flying Club.

June 11—Annual breakfast Fly-in, Starke County Airport, Knox, Indiana, by Starke County Aviation Club.

June 13-15—Annual meeting Aviation Distributors and Manufacturers Assn., Dennis Hotel, Atlantic City, N. J.

June 18—Annual CAP Fly-in breakfast, Crosson Field, Sterling, Colo.

June 18—Dawn Patrol, Haines Airport, Three Rivers, Mich.

June 18—Fly-in breakfast and air show, Ranchaero Airport near Chico, Calif., by the Chico Squadron of the Civil Air Patrol. Contact David Kimsey, 1052 E. 7th St., Chico, Calif.

June 18—Annual breakfast Fly-in at Oshawa Airport, Ontario, Canada, sponsored by Ontario County Flying Club. Customs for U. S. visitors, unicom (122.8) and signal lamp control. Contact G. Slocombe, P. O. Box 413, Oshawa, Ontario.

June 18—Annual Fly-in breakfast, Clarinda, Iowa, by Clarinda Flying Club.

June 20-22—National meeting American Meteorological Society, Davis campus, University of California.

June 25—Annual Fly-in breakfast, Bluffton Airport, Bluffton, Ohio, by the Bluffton Flying Club.

July 1-4—First Great Plains Soaring Championship, Harvey Young Airport, Tulsa, Okla. Tulsa Skyhawks Soaring Club, P. O. Box 1345, Tulsa.

July 2—Annual Air Show, Greenwood Lake Airport, West Milford, N. J. Rain date July 9.

July 8-12—All Women's Transcontinental Air Race, San Diego, Calif., to Atlantic City, N. J.

July 15-16—Annual overnight camp-out at Lake of the Woods, Ore., by Oregon Pilots Assn.

July 22-23—Fly-in Pow-wow at Kern County Airport No. 7, Mojave, Calif. Barbecue by the California Chamber of Commerce and Edwards AFB Aero Club. Contact Manager, Kern County Airport No. 7, Mojave or A. E. Taylor, P. O. Box 234, Edwards, Calif.

July 25-Aug. 10—International Aviation Exhibition, in conjunction with Chicago International Trade Fair, Chicago exposition hall. Contact H. Hayward Hirsch, director of International Aviation Exhibition, Chicago International Trade Fair, 30 West Monroe St., Chicago 3, Ill.

July 30—Annual Fly-in drive-in breakfast at Civil Air Patrol Headquarters, Bayview Airport near Burlington, Wash. New, experimental and antique aircraft invited. Contact Joe Morgan, C.O. Skagit County Squadron, CAP.

August 6—Annual Fly-in and fish dinner, Oregon Pilots Assn. Contact Capt. Harold E. Aune, 30 W. Grand Ave., Astoria, Ore.

Calendar items must be received by FLYING's editorial office, 1 Park Avenue, New York 16, N. Y., two months prior to the event.

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CESSNA Skylane (182) 1960—like new—only 34 hours—Narco Mark II Omni—ADFIZEZ—loaded with extras—must sell—$15,500.00, save $4000.00. Strom Machinery Corporation, 1818 Summer St., Hammond, Ind.

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150'S: 6 available. 1959 Trainer #JJJX/EF, has 180 total hours. Damaged, Repaired by Cessna Distributor. March 1961 completely repainted, new propeller, tires, relicensed. Primary blind. LF. Omnirange. Beautiful. $5,575. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

170'S: 19 from $3,950. 1954, 170B #GQGX/AF, has zero SMOH. Gyros. LTRA-6 omnirange. Relicensed January. $5,500. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

172'S: 21 from $6,200. 1956, #RPFR/AF, has 230 hours SMOH. Completely painted 1959. Gyros. LF. 12 channel Superhomer. Hangared. Undamaged, Relicensed February. Like new. $6,600. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

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182'S, SKYLANES: 17 available, 1956, 182, #RGZG/BF, has 140 hours SMOH. Gyros. Omnigator. ADF-12. Bargain. $7,700. Also; 1958 Skylane #XQZQ/GF, with 430 total hours. Gyros. RT-10 twelve channel transmitter. Mark-2 Omnigator. ADF-12. Extras. Hangared. Undamaged. Relicensed March. $11,000. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

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ALL Amphibious Models: Goose, #GPTX/F, has 150 hours SMOH. 8 place. Beacon. Dual blind. LF. Dual Mark -2—ARC-15D omnirange. Dual Dare VHF transmitters. ADF. Fabric excellent. No corrosion. Clean. Extras. Bargain. $30,000. Make offer. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

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LOCKHEED 12-A, serial #1258, license N-19933, air frame has a total of 4600 hours since manufactured. New exchange motors with chrome plated cylinders by Univair, new Hartzell C-3 three bladed props by L. L. Walker of Houston, 50 gallon auxiliary gas tank in cabin on left side of rear cockpit bulkhead, upholstered wtih magazine rack on top (by Spartan), oxygen system for six people, new brakes, thermos bottles and rack on rear right baggage compartment, storage compartment and toilet with upholstered bulkhead and door, 4 seats, curtains, recently completely upholstered by Horton and Horton, sound-proofed throughout, all bulkheads with doors are upholstered and soundproofed, card table between 2 seats, painted blue with cream top (Alamo Aviation). 91 hours since all of above work completed. Regular annual inspection December of 1960. New and all necessary radio equipment. All of above alterations and additions completed recently. A real bargain. No trades. H. M. Naylor Oil Company; 1100 Texas Eastern Building; Houston 2, Texas. Phone: Capitor 4-9331.

MEYERS

200: 1959, 4 place, #FZF/CF, has 390 hours. 240 HP Continental. Gyros. Lear Navcom 100B 90 channel transmitter, 140 channel omnirange receiver. Second transmitter ADF-12E2. Gonio loop. Excellent. $16,500. Powers & George, 475 Fifth Avenue, New York 17, N. Y. "Exporting."

MOONEY

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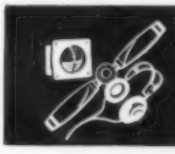

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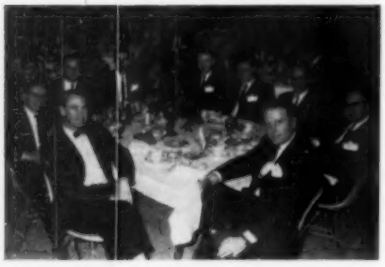
BRIEFINGS...

(Continued from page 8)

followed in order by FAA, using 119 aircraft; Agriculture Department with 63, and Interior Department with 50 planes and helicopters. The Weather Bureau leases three aircraft for severe storm research.

Only representatives of wholesale firms which have sold a million dollars' worth of Narco radios are seated at the central table at the Awards Banquet, highlight of National Aviation Corp.'s annual meeting at Washington, Pa. Honored this year were: (clockwise from left): Pat Murphy representing



General Aircraft, Detroit (2nd million); Ginor Cantele, Air Associates, Chicago (3rd million); Sid Anderson, GASCO, Oklahoma; Don Horn, Don Horn Co., Memphis; Rob Winick, Van Dusen-Minneapolis; Ray Hall, Van Dusen-Teterboro (4th million); Don Hamilton, Standard Products, Wichita; Bob Fern, Norman Larsen Co., Van Nuys, Calif.

One of the oldest and largest instrument shops; FAA-approved, Oregon Air-Motive, of Portland, changed hands recently and was sold to Flightcraft, Inc., by C. E. Perrott, owner-founder. The firm is located in Flightcraft's new private air terminal, adjacent to the airline terminal. Perrott remains with the firm as shop manager.

Production of the two-place all-metal Shinn 2150-A (former Morrisey 2150) is going into high gear at the Shinn Engineering Company's new Dyer Road facility in Santa Ana, Calif. Monthly production plans call for ten planes. Shinn Engineering, producers of aircraft and missile components, recently acquired the manufacturing and sales license to the Morrisey 2150 and has named veteran pilot Robert Follett as sales manager for this aircraft.

Highest volume of new business in almost three years, excluding April 1960, is the report from Aero Commander, Inc., Oklahoma manufacturers of aircraft under that name, for the month of February. Aero Commander distributors at home and abroad reported that, in almost every instance, the orders came from corporate users.

If your flight plans include the Bahamas and Caribbean Islands, Mexico or the State of Wisconsin these privately published books should be helpful: "Private Plane Flight Guide, Caribbean and Bahamas by Gunnar and Lena Brune, 4762 Kyle Ave., Fort Worth, Tex., 133-page illustrated book in detail, $5. "Vacation Air Mexico," by William D. and Edith Maddron, P.O. Box 3382, Eugene, Ore., 124 pages, illustrated, $5. It too is quite complete. And "The Wisconsin Illustrated Directory of Airports," by Sky Eye, Inc., 2419 S. 77th St., West Allis, Wis. Price: $7.50. With annual revisions, $3.25 additional.

Preparatory to introducing the French-built Caravelle jets to the U. S. in June, United Air Lines has assigned 15 members of its Denver flight operations administration to Europe for special training and subsequent establishment of a training program for an additional 18 to 20 flight instructors. Eight UAL pilots received training in Stockholm at Scandinavian Airlines Caravelle training base, then proceeded to Sud Aviation's Plant at Toulouse, France. Seven technicians were assigned to Crowley, Sussex, England for Caravelle simulator training at Redifon, Ltd., builders of the Caravelle simulator.

A 12-nation demonstration tour of the Beechcraft Baron, Model 55, newest in the company's line, is drawing to a successful conclusion. Under direction of Beech's export staff members Alex Kvassay and Leo Sanders, the demonstrations started in Greece on March 14 and continued in Turkey, Lebanon, Iran, Pakistan, India, Ceylon, Burma, Malaya, the Philippines and Australia. Final demonstrations are scheduled in Manila on May 8.

Helicopter Sales, Inc., new world-wide used helicopter and parts firm has opened headquarters at 125-12 84th Road, Kew Gardens, 15, N. Y. In addition to sales, the firm is offering leasing and financing services.

United Airplane Sales, Inc., Flight School in Wichita, Kan., has become the third flight training center in the country authorized by FAA to graduate students as certified private pilots. This authorization is designed by FAA to give highly rated flight schools increased responsibility in the training of pilots. Jack Dixon is founder and manager of United's flight department.

It was the same trip all over again, with a few exceptions, for Maurice Bellonte as he arrived in New York with his wife from Paris March 13. In 1930 he and Dieudonne Costes made the first nonstop Paris to New York flight in a Breguet biplane named the

Question Mark. That trip took 37 hours 17 minutes. The second, aboard an Air France jetliner, took under eight hours. The 64-year-old aviation pioneer, who is Inspector General of Flight Safety in France, is here to visit U.S. aircraft and engine plants and FAA facilities.

Grants in the amount of $21,250 for 1961 have been announced by The Link Foundation. Nine major universities, three national institutions and agencies, including the Flight Safety Foundation, Smithsonian Institution's National Air Museum and the Arnold Air Society are among the recipients. Additional grants may be made in 1961 to support Air Traffic Control and Flight Training projects. Since its establishment in 1953 by Edwin A. Link, grants totaling $178,075 have been awarded for 97 projects.

Permission has been granted by FAA to members of the Parachute Club of America to pack their own main backpack parachutes, when jumping in accordance with the basic safety regulations under supervision of safety officers. The exemption holds until December 1, 1961 and applies only to PCAers under stated conditions.

Florida Airport—Multiply and expand is the story of Orlando Municipal Airport since WW II. Only recently named Herndon Field, in honor of former city engineer, A. B. Herndon, who was largely responsible for its remarkable development, the airport's latest addition is a $70,000, 640-foot-long T-Hangar, built by Howard Showwalter Jr., president of Showwalter Flying Service. This hangar accommodates some 30 aircraft, from light single-engine to twin-engine types. Showwalter's 1947 facilities could house four lightplanes; now 75 can be hangared, another 75 tied down.

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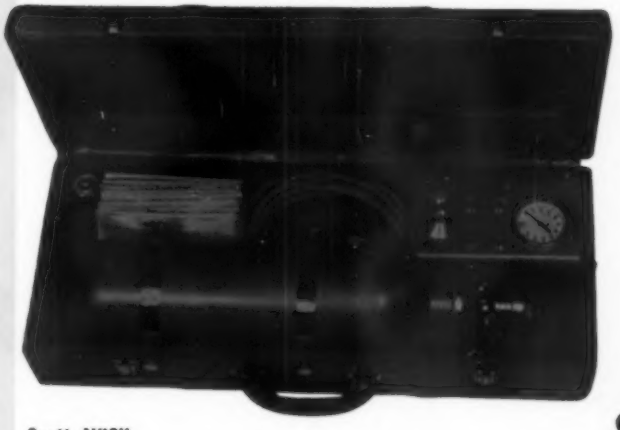

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